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ABSTRACT

The five papers contained in this document were written by individuals with nationally recognized expertise on the selected subjects and designated experts presented reviews of the papers during the institute. Topics include: (1) "An Assessment of Present Information Systems and Implications for Vocational Education" by Douglas C. Towne, (2) "Systems Analysis as an Instrument for Change in Urban Education" by David S. Bushnell, (3) "Long Range Planning in Vocational-Technical Education" by Joseph F. Malinski, (4) "An Overview for the Application of Community Resources Relative to Specific Educational Needs" by A.P. Garbin, and (5) "Using the Delphi Technique and Simulation Exercises in Implementing Planned Program Change in Vocational Education" by Donald Anderson. A related document, Volume I, is available as VT 014 111. (GEB)

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WESTERN METROPOLITAN AREA APPLICATION OF VOCATIONAL EDUCATION INNOVATIONS RESULTING FROM RESEARCH AND DEVELOPMENT PROGRAMS

Volume II

Part of
Short Term Institutes for Inservice Training of
Professional Personnel Responsible for Vocational -
Technical Education in Western Metropolitan Areas

Ivan E. Valentine
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Albuquerque Technical Vocational Institute
Albuquerque, New Mexico

in cooperation with
Colorado State University
Fort Collins, Colorado

June, 1971

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
National Center for Educational Research and Development

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Final Report
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Part of
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Responsible for Vocational-Technical
Education in Western Metropolitan
Areas

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Department of Vocational Education

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U.S. DEPARTMENT OF
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TO THE PARTICIPANT:

This booklet contains five papers written by individuals with National recognized expertise on the selected subjects.

Designated experts will present written reviews of the papers during the Institute. Other qualified persons will review and critique the prepared papers in advance, then make an oral presentation and set the stage for small group working sessions throughout the conference.

The individual Institute participant is expected to become familiar with the content of each paper to the extent he will be a contributory member of his working group.

Each participant's reaction to the prepared papers will determine the success of Institute Number IX.

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AN ASSESSMENT OF PRESENT INFORMATION SYSTEMS AND IMPLICATIONS FOR VOCATIONAL EDUCATION

Prepared for:

INSTITUTE IX

METROPOLITAN AREA APPLICATION
OF
VOCATIONAL EDUCATION INNOVATIONS
RESULTING FROM
RESEARCH AND DEVELOPMENT PROGRAMS
Albuquerque, New Mexico

by

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AN ASSESSMENT OF PRESENT INFORMATION SYSTEMS AND IMPLICATIONS FOR VOCATIONAL EDUCATION

by

Douglas C. Towne

Education is an information system. Perhaps it is the most complex and comprehensive information system ever to be known by man. Viewing education as an information system, however, is somewhat foreign to most persons, including the educator. Such a perspective of education as an information system provides many guidelines and implications for action helpful in our efforts to improve the learning experiences provided our citizens.

Viewing the educational system as an information system helps not only in providing guidelines and implications for improvement. In a much more crucial way it helps us identify and frame relevant questions we need to ask in order to foster the continuous improvement of learning experiences. If education does not become this dynamic and ever-changing institution we are bound to see the institution (establishment) come "tumbling down" about us. The fact seems obvious to me that appropriate and valid questions are of more importance than superficial or irrelevant answers. In the long run we will find adequate answers to valid questions whereas superficial or irrelevant answers will only misdirect and thwart our efforts to improve education.

The purpose of this paper is to present for your consideration some thoughts relevant to the two major topics of this institute: (1) educational information systems and, (2) educational change. These two areas of study are inextricably entwined. They compliment and supplement each other; neither can be adequately considered without reference to the other and only when they become appropriately meshed do we find edcuational improvements of the finest distinctions. When the two are not meshed we observe waste, inefficiency, inappropriateness and irrelevancy. Several models will be presented to illustrate the various factors within, and relationships between, these two crucial concerns of educational change and educational information systems.

This paper is a conceptual presentation rather than a technical presentation for various reasons. The first reason is that other papers to be considered will be of a more technical nature and will go into greater depth in their respective areas. Secondly, both the fields of educational change and information science have highly specialized and knowledgeable experts better qualified to present their respective techniques (the references cited throughout as well as a reading list of selected items will be found to be most useful to those wishing further study).

A third reason for presenting a conceptual paper stems from three major shortcomings of most existing information systems. Too often information systems evolve into a system of benefit to the information specialist rather than the client group for which it was originally designed. Such systems, once established, are hard to alter or eliminate. They tend to become self-serving. Such would not be the case if the client were more conversant with the conceptual factors involved. Another major shortcoming of many existing systems is their inability to serve client needs because of a lack on the part of the client in conceptualizing the types of data and information required in his decision-making process. It is expected that the model presented will aid in clarifying these informational needs. The third shortcoming of existing systems is a narrowness of orientation. Education is a complex phenomenon and educational change is equally complex. When educational change incorporates the outputs of information services such services must in turn be complex. At present many information systems are designed more to match the types of information to be contained than the types of uses such information is to serve.

As a result of these three shortcomings in present information systems the major reason for presenting this paper in a conceptual manner rather than in a technical manner is derived. If an information system is to fully serve the educational change process it must meet the needs of the educational change agents. Seldom are these change agents experts in informtion systems. They should not be, for information is a means to an end -- not an end in itself. Therefore, the change agent must concentrate on the product; namely, educational change.

In this paper I will present several models portraying educational change and information systems. These models are a type of shorthand designed to outline the essential elements of systems or theories as an aid to quick understanding and conceptualization. Each model is deserving of much greater consideration and study. It is expected, however, that these essential elements will aid the synthesis process and will result in a more complete conceptualization of the intricacies and interactions which exist within and between these activities of educational change and programs of information services.

Models of Educational Change

A great amount of research and other writing has dealt with the change process. Several fine reviews of this literature have been compiled during the last few years (Havelock, 1969; Rogers, 1962; Bennis, Beene, and Chin, 1969.)* All change agents in education should be familiar with these reviews. Society is becoming ever more change oriented. Education will in turn become more change oriented. If educators are not conversant with the processes of change they will soon find educational changes being imposed upon them from outside sources.

Havelock (1969)** in reviewing 3,931 documents concerned with change, has posited four models of change: (1) The Research, Development and Diffusion model, (2) The Social-Interaction model, (3) The Problem-Solving model, and (4) The Linkage model. The following descriptions are not extensive nor comprehensive but rather attempt to illustrate the essential elements of each model so that the role of information and information systems in each model may be illustrated.

The Research, Development and Diffusion (RD & D) Model

This model (Figure 1) is a neat and logical representation which

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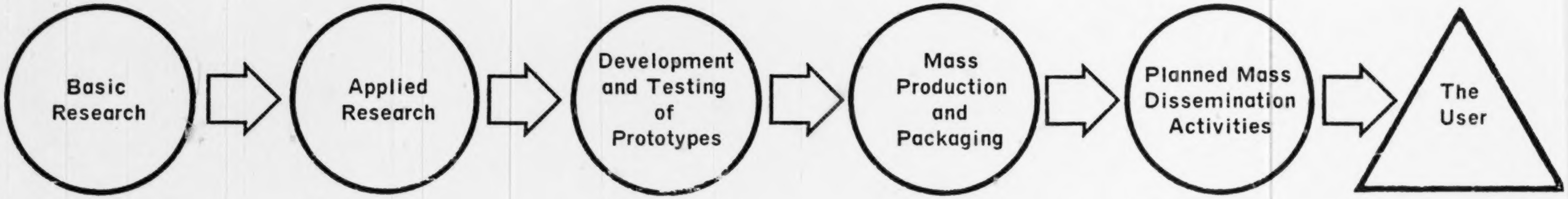
* See also Major Works on Change in Education: An annotated Bibliography with Author and Subject Indices, by Havelock, Huber, and Zimmerman.

** From this point on all references to Havelock will refer to this major review unless a date appears in parantheses following his name.

Figure 1. The RESEARCH DEVELOPMENT AND DIFFUSION PERSPECTIVE


Basic Research
Applied Research
Development and Testing of Prototypes
Mass Production and Packaging
Planned Mass Dissemination Activities
The User

immediately appeals to the rational man. Its basic elements include: basic research, applied research, development and testing or prototypes, mass production and packaging, planned dissemination activities, and finally the user. Its major advocates according to Havelock are Brickell (1969), and Clark and Guba (1965). The linearity conveyed by the model is staunchly denied by Brickell and Clark and Guba but, nevertheless, such perspective tends to orient one to a neater and more rational or logical approach than is perhaps possible in a human social activity such as education. (Such linear orientation, on the other hand, has been found to be most effective in the area of agriculture).

Havelock presents five basic assumptions inherent to this model: (1) RD & D is a rational sequence, (2) extensive planning is necessary, (3) division and coordination of labor is required, (4) the users are passive but rational consumers and (5) high initial development costs prior to any dissemination activity. Such assumptions may be compared to the existing situation in vocational-technical education. How well do we meet these assumptions? Are we moving toward a situation more amenable to these assumptions? Is vocational-technical education becoming more a science and less an art?

Several aspects of both information and information systems are illustrated in this model. Each of the six elements of this model is an information system itself. It might be helpful to consider this model as representing individuals ranging from the basic researcher to the user or practitioner. (Individuals must be perceived as information systems.) Portraying the model in these more humanistic terms we might first ask ourselves if vocational-technical education has indeed the individuals filling each role; we certainly have the practitioners. Many of our teacher training institutes perform the role of the applied researcher. We find many "planned mass dissemination activities" ranging from department faculty meetings to institutes such as the one you are now involved in. Basic research is continually being conducted - usually outside the field of vocational-technical education.

The major metropolitan areas will come closest to having the remaining two elements if they exist. Do you find agencies, organizations and/or individuals whose prime concern is the "development and testing of prototypes" or the "mass production and packaging" of innovations? Is it not more likely that these responsibilities are relinquished to commercial firms such as textbook publishers? Should this be the case?

In addition to determining if these elements exist within our field, it is also crucial that we assess their effectiveness. I submit that our weakest links in this model are the "development", "mass production" and "dissemination" elements. This may not be the case in some of the more progressive metropolitan programs of vocational-technical education.

Another pertinent characteristic illustrated in this model is the information linkage between the six elements. Research has provided ample evidence that we tend to talk to ourselves, i.e., we are more inclined to communicate with persons within our peer group than we are with those representing different areas of interest. What systems or procedures now exist to facilitate interaction between diverse groups? How effective are they?

Another intriguing aspect pointed out by this model is the neatness and concreteness of the movement from basic research findings to alterations in practice. This may well be possible in fields such as agriculture where a new hybrid can easily be shown to be more or less effective than those now in existence, or in industry where a new compound is clearly superior to those now available. Is such objectivity or relative advantage as easy to observe in vocational-technical education? I would maintain that such is not our advantage at the present time.

Perhaps the major shortcoming of this model is information transmission from right to left, from user to basic research. Seldom does direct communication of this nature occur between adjacent elements - much less more distant elements. This lack of feedback capacity leaves somewhat to chance the selection of user-relevant problems by the basic and applied researchers. This approach has been found to work in areas such as agriculture and industry. Whether it is efficient enough for the tight budgets of education is debatable.

If user needs are considered in the basic and applied research areas they are generally based on analyses of macro-level data and information. There are obvious flaws in relying on such gross information. Seldom, however, are data at the micro-level available for such analyses. Efforts to provide such specific micro-level data should be encouraged.

Many more points for discussion are raised by this model; both positive and negative. My major contention is that as "clean" and logical as this model is another may be more appropriate to vocational-technical education in metropolitan areas. Education is too "user" oriented to allow a model ending with the user rather than one beginning with the user.

The Social-Interaction (S-I) Model

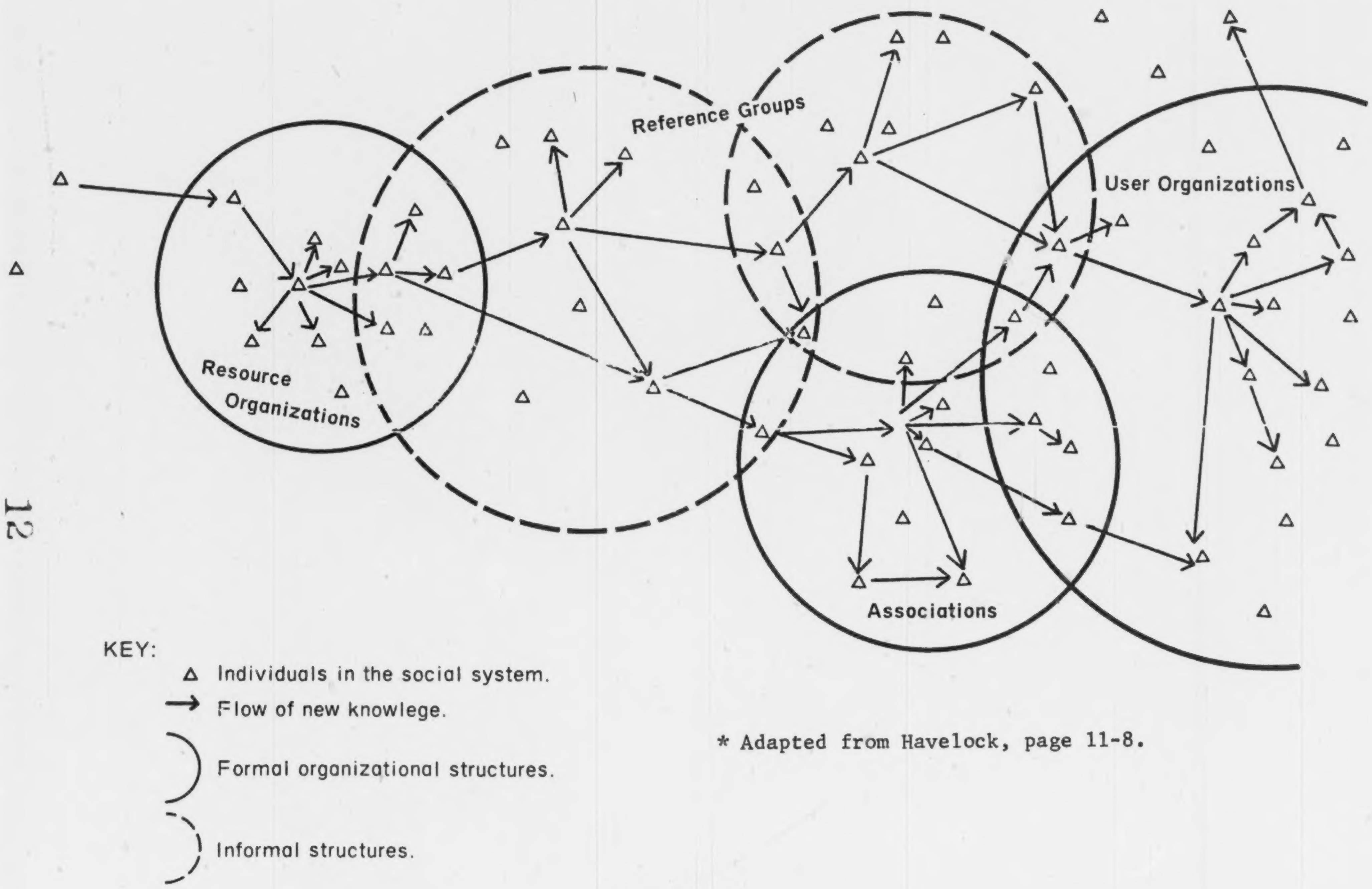
If the RD & D model is portrayed as a "clean" and "neat" model the Social-Interation model (Figure 2) is best described as "messy". The basic elements of the S-I model are (1) individuals associated with various, (2) organizations or associations with, (3) lines of communication linkages between these various individuals and organizations or association. Major spokesmen for this approach to change are Rogers (1962), Mort (1964), and Carlson (1965), according to Havelock. Figure 2 attempts to portray the essence of this approach to conceptualizing the change process. As with the RD & D model this is also primarily uni-directional with innovations being communicated from left to right. It also ends with the user.

Havelock further suggests five major generalizations inherent to this model: (1) the individual user belongs to a "network" or social relations, (2) the placement of the individual within this network predicts his rate of acceptance of innovations, (3) a vital element is the informal contact between individuals, (4) the individual's group memberships and reference groups predict his adoption pattern of behavior and (5) there exists an S-curve of diffusion rates (a slow start with few individuals adopting, followed by a rapid rate of adoption which in turn is followed by another slow rate of adoption as the "laggards" finally adopt).

Such an approach to change graphically illustrates the role of inter-personal communications. As mentioned earlier such communications are more often held with persons within our established groups rather than those from other groups. The innovators are those appearing in the overlapping circles, i.e., they belong to two or more groups or organizations with differing areas of interest.

A glaring shortcoming of this approach to information transfer in the change process is the inefficiency involved. Not only does it take an excessive amount of time to transmit messages but the messages must also be relatively small and discreet.

Figure 2. The SOCIAL INTERACTION PERSPECTIVE *


Reference Groups
User Organizations
Resource Organizations
Associations
KEY:
Individuals in the social system.
Flow of new knowlege.
Formal organizational structures.
Informal structures.

* Adapted from Havelock, page 11-8.

This model illustrates the necessity of the support provided by individuals which greatly facilitates the adoption process. Without such personal support few individuals would venture into innovative programs. These personal supportive roles vary with the change orientation of the persons involved, i.e., the innovator gains support from outside persons while the opinion leader lends support to the later adopters and gains support from the innovator.

When applying this model to the field of vocational-technical education questions immediately arise: How heterogeneous are our professional and formal organizations? How many different professionally related organizations do our people belong to and participate in? Do we foster or hinder the "cross-pollination" process through administrative policies and travel regulations? Do Distributive Education teachers communicate with Health Occupations educators? What percentage of the teachers and staff members within an urban school's department of vocational-technical education attend out-of-state professional meetings each year? I would suggest that persons within our field do not communicate as broadly or as frequently as could be desired.

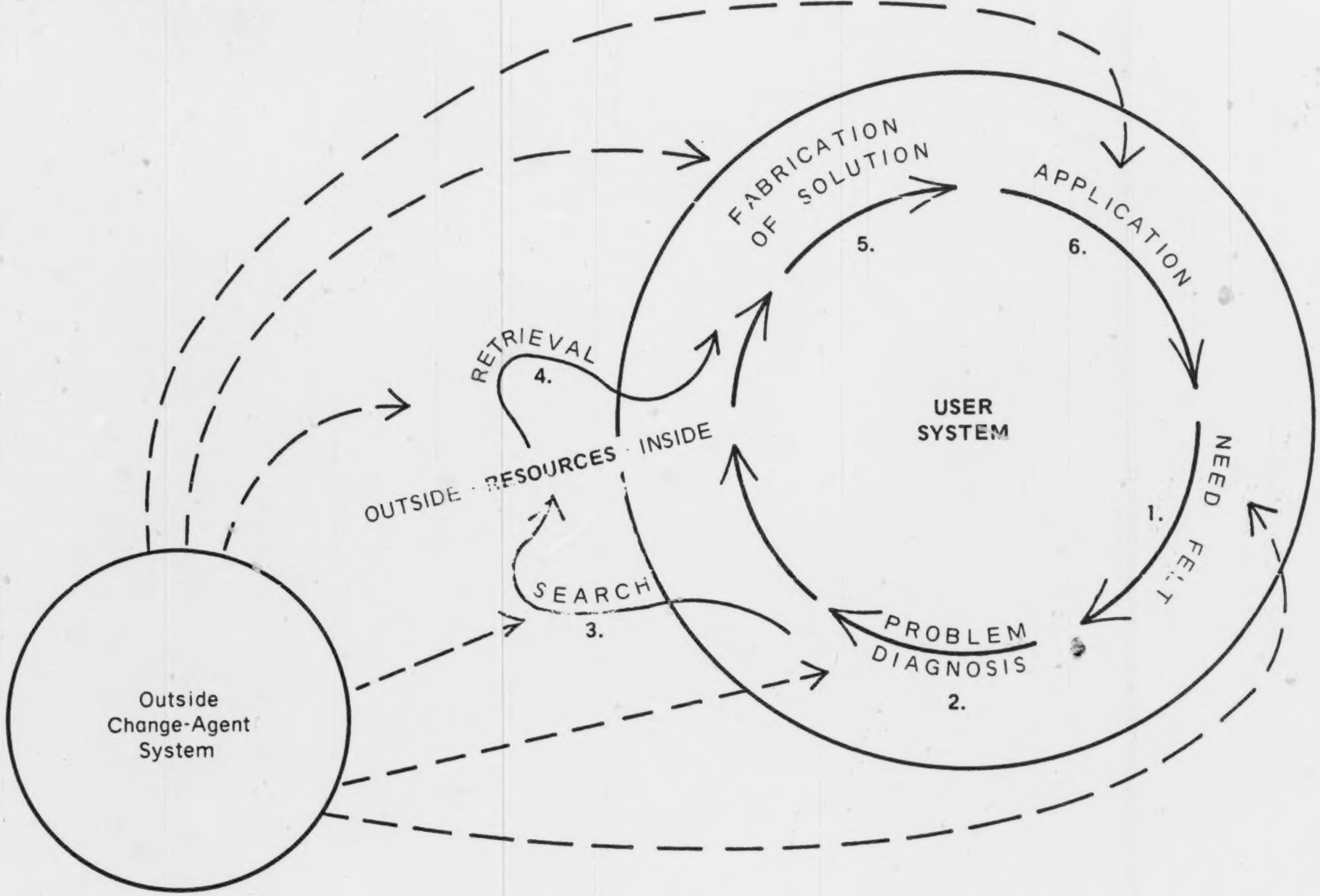
If change is brought about through interpersonal communications as this model suggests (and for which ample supportive empirical research data is available), are we fully utilizing this resource of educational change?

These two models have emphasized the user as recipient of fully developed innovations. The user, to a large extent, is not involved in the innovation development but rather is seen as a consumer "buying" the developed product. The next two models portray the user in different roles. In these next two models the user is cast more in the role of an employer hiring consultants to work on their, the users', problems! Here the user is seen as initiating the information transmission and utilization process.

The Problem-Solver (P-S) Model

The Problem-Solver (P-S) model (Figure 3) is the third perspective identified by Havelock's review of the literature. The elements of this model include: (1) the user or client, (2) the outside process

Figure 3. The PROBLEM-SOLVER PERSPECTIVE *


FABRICATION OF SOLUTION
5.
APPLICATION
6.
USER SYSTEM
NEED FELT
1.
PROBLEM DIAGNOSIS
2.
SEARCH
3.
RETRIEVAL
4.
OUTSIDE · RESOURCES · INSIDE
Outside Change-Agent System

---

* Modified from Havelock, page 11-12.

consultant (change-agent), (3) resources, both within and ouside the user system and (4) the problem solving process. As illustrated the problem solving process begins with (1) a felt need, followed by (2) problem diagnosis, (3) a search for solution resources, (4) retrieval of alternative solutions, (5) fabrication of a solution and finally (6) application of the adapted* solution.

According to Havelock the major proponents of this model include Lippitt, 1958; Watson, 1967; and Thelen, 1967. It is a model I find quite alluring also due to the emphasis upon the user. Havelock finds the following five points usually stressed by supporters of this model: (1) the users' need is paramount, (2) diagnosis is an integral part of the process, (3) the outside change agent should be non-directive, (4) internal resources should always be fully utilized, and finally (5) self-initiated and self-applied innovation has the strongest user commitment and best chance for long-term survival.

A crucial person in this model is the outside change agent. Too often persons are so involved in their own jobs that they fail to see "the woods because of the trees". Such can be partially overcome by appropriate utilization of an uninvolved "outsider". One might criticize this model in that it deals with problems only after they arise rather than avoiding problems. This may be more a matter of degree, however, than an outright indictment. These points support the contention that diagnosis is a critical part of the problem solving process. If the user and the change agent have access to accurate and reliable information relevant to the existing situation their diagnosis will be greatly enhanced.

One major disadvantage which might be suggested in this approach is the centrality of problems within the organization or institution as perceived or diagnosed by persons committed to the agency (the change agent usually becomes involved and committed soon after he is attached to the user system). Such perceptions and diagnoses may therefore deal with superficial problems rather than more basic questions such as should the institution even exist? Or should the organizational structure be vastly revamped? Such basic questions seldom will arise from within an agency or organization.

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*Seldom is a suggested solution accepted without some adaptation to the users' environment.

Another phase of information systems illustrated in this model deals with the access to internal and external resources. The change agent may be most helpful in identification of resources both within and outside the user systems. Users are often unaware of the vast resources available to them in different but related fields of endeavor. In addition they may have become so engrossed in their day-to-day activities that they fail to keep up with new services and materials within their own system.

The role of the outsider may be as catalyst, consultant or collaborator (Havelock, 1970). As a catalyst the outsider might create dissonance by criticizing or "protesting" the existing institution. (The 1968 Perkins bill could be perceived as the result of a catalytic agent in that it challenged vocational education to become more"relevant" and attuned to our times.) The consultant role might best be perceived as the change agent serving in the role of "solution-giver". In this role the change agent offers solutions to the problems posed by the user system. The third role of collaborator has the change agent assisting the user in all steps of the problem solving process.

The role of the change agent as collaborator has been very well presented in a handbook for change agents developed by Havelock (1970). In this handbook Havelock presents specific and clear directions* to the agent in progressing through six stages designed to help move the user from the present state of educational affairs to the desired future state of affairs. The six stages are: (1) building a relationship (between change agent and client), (2) diagnosing the problem, (3) acquiring relevant resources, (4) choosing the solution, (5) gaining acceptance and (6) stabilizing the innovation and generating self-renewal.

This handbook should be most useful to any person concerned with the task of helping a user system through the change process. Such persons playing this helping role would be administrators and supervisors within a metropolitan school system as well as the state supervisors, teacher-educators and other persons normally perceived as consultants or change agents.

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*The directions being very specific and clear has resulted in one criticism of the document; however, the specificity will be necessary for some readers.

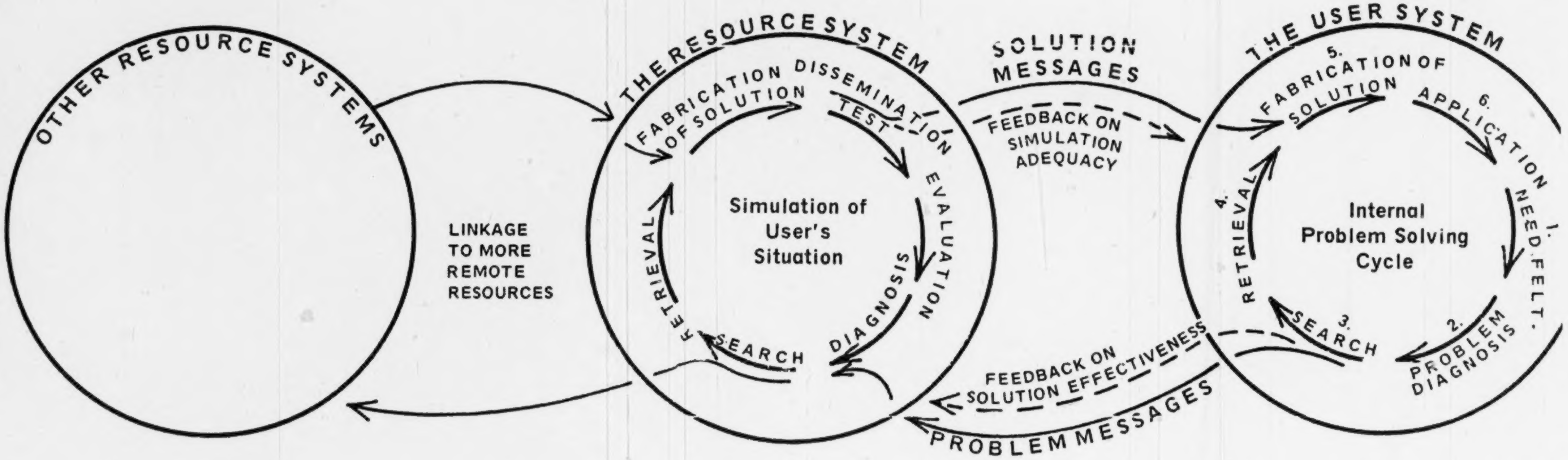
The Linkage Process Model

The Linkage Process is portrayed in the following model and illustrates the key elements of (1) the user system and its internal problem solving cycle, (3) the change agent resource system simulating the user's problem solving cycle, (3) linkage between the user and resource system and (4) linkage between the resource system and more remote resources. This model was developed as a result of Havelock's perceptions of the literature reviewed and the fact that none of the three previously cited models seemed general enough. Havelock felt that a meshing of the three models (RD & D, S-I and P-S) might best be illustrated as the linkage process (Figure 4).

In the linkage process there are four essential assumptions or generalizations: (1) the resource system must be able to simulate the user systems problem-solving processes, (2) the user must be able to understand the processes used by the resource system in generating solutions (whether those processes consist of research, development, evaluation or diagnosis), (3) the resource and user must maintain full and honest reciprocal feedback, and (5) linkage experiences lead to effective channels of information dissemination. (It should be pointed out that inherent to this model is the resource system appearing in a slightly modified "user role" when utilizing the more remote resources.)

Several types of information and information services are involved in this model. Again it becomes obvious that the user system must have access to accurate and complete data concerning his operation in order to conduct a valid diagnosis of the problem. The search and retrieval phases rely more on the resource than the user and therefore the resource system must be aware of and acquainted with as many potentially useful resources as possible. Another critical informational phase of this model is translation. The resource system's major role might well be the difficult task of translating information from the language of the more remote resources into terms familiar to the user system. This translation is no easy task; however, attempts have been made with varying

Figure 4. The LINKAGE PROCESS *


OTHER RESOURCE SYSTEMS
LINKAGE TO MORE REMOTE RESOURCES
THE RESOURCE SYSTEM
FABRICATION OF SOLUTION
DISSEMINATION
TEST
EVALUATION
DIAGNOSIS
SEARCH
RETRIEVAL
Simulation of User's Situation
SOLUTION MESSAGES
FEEDBACK ON SIMULATION ADEQUACY
FEEDBACK ON SOLUTION EFFECTIVENESS
PROBLEM MESSAGES
THE USER SYSTEM
1. NEED FELT.
2. PROBLEM DIAGNOSIS
3. SEARCH
4. RETRIEVAL
5. FABRICATION OF SOLUTION
6. APPLICATION
Internal Problem Solving Cycle

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* Modified from Havelock, page 11-16.

degrees of success.*

Another major process in information utilization which must be considered in this model is the search and retrieval process which must usually be taught to the user so that he may perform these roles in the future. It is logistically impossible to provide a resource individual to all users with a need. It is desirable and perhaps necesary, therefore, to instruct the user throughout the entire change process so that he will then be capable of performing these functions in the future without the assistance of the linkage resource. Such instruction will be a part of all types of assistance provided by the linkage resource but the stages of search and retrieval need special attention since these are the two items the linkage resource is most likely to take major responsibility for. It is therefore essential that the user be involved in these processes as much as possible so that he will be willing to perform these tasks in the future without the aid of the linker.

Implications

In summarization of the preceding materials on the relationships between educational change and information sources and services many points are abvious. Perhaps the most obvious is the fact that this has been a cursory and far from complete review. Such extensiveness was not the intent, but rather, the purpose was to conceptualize certain relationships which seem most important at the present time.

Of the points presented in this paper several seem to have obvious and important implications to the field of vocational-technical education in major metropolitan areas. I will present only three which I feel are of prime importance and relevant to the topic at hand.

1. Social Interaction

It is apparently very important in order to foster change that we facilitate social interaction processes within our field and between our field and other which are related but in somewhat indirect ways. One could easily posit a direct relationship between social interaction and ability to innovate.

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*An example of this function can be seen in the interpretive studies funded by the US Office of Education. Two which are relevant here are Havelock (1970) and Banta & Towne (1969) and (1970).

You are in the best position to assess the quantity and quality of interaction within urban area vocational-technical education. Do these persons have ample opportunity to talk with their peers both within the system and between systems? Do they attend professional meetings outside their region and state?*

It must also be kept in mind that information comes packaged in many different forms. Not only are people information systems but also magazines, journals, films, television and any number of other types of communication packets. Questions related to the ones above can be asked regarding the degree of exposure of our staff members to such packets outside the field of vocational-technical education. What types of journals and other literature do you read? How diverse is the subject matter? How much time do you spend reading? The same can be asked of your staff members.

The type of interaction dealt with in the S-I model was primarily a personal, one-to-one relationship. These relationships have been suggested as necessary even with impersonal communications such as the mass media system of television and radio. This point may best be illustrated by quoting Wilbur Schramm (1969) and presenting an adaptation of the model (Figure 5) he presents.

> Unlike lecture audiences and small groups, mass communication audiences (with the exception of the people in a motion-picture theater at the same time) have very little contact with each other........ These audiences are individuals, rather than groups. But each individual is connected with a group or groups - his family, his close friends, his occupational or school group - and this is a very important thing to remember about mass communication.
>
> The more we study it, the more we are coming to think that the great effects of mass communication are gained by feeding ideas and information into small groups through individual receivers. In some groups, as you well know, it is a sign of status to be familiar with some part of mass communication (for example, in the teenage group

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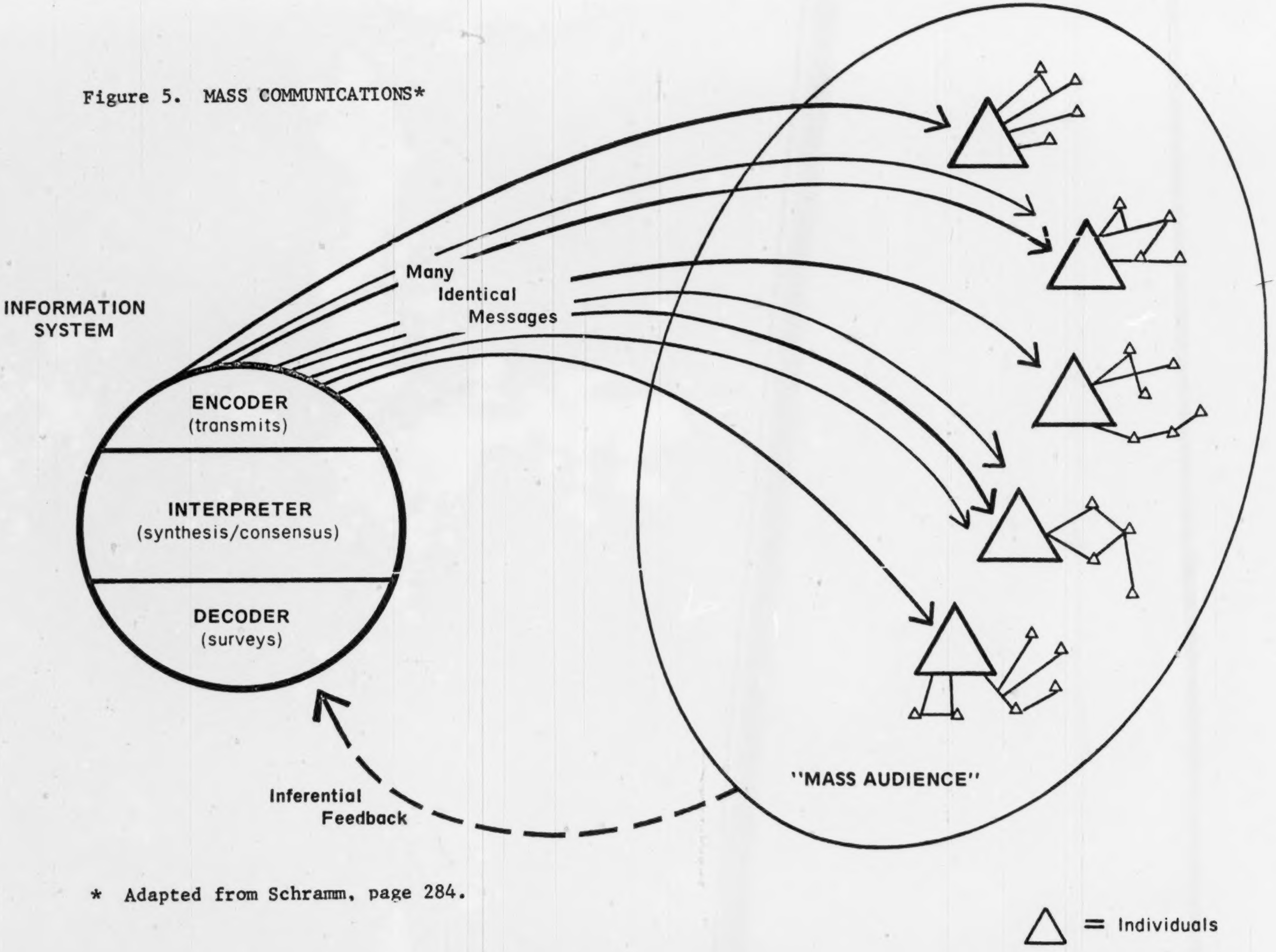
*A rather disconcerting phenomenon I have observed in the recent past is a reluctance of some administrators, at all levels, to allow their staff to participate in institutes or conferences conducted outside their immediate geographic area. I would be the first to agree that many of these prove to be ineffective in accomplishing their stated goals but the personal interactions which occur may offset this failure.

Figure 5. MASS COMMUNICATIONS*


INFORMATION SYSTEM
ENCODER (transmits)
INTERPRETER (synthesis/consensus)
DECODER (surveys)
Many Identical Messages
"MASS AUDIENCE"
Inferential Feedback
△ = Individuals

* Adapted from Schramm, page 284.

> the teenage group to hear the currently screamable crooner, or in some business groups to read the Wall Street Journal). In many a group, it is a news story from the radio, or an editorial from the Times, or an article from the Tribune, or an article from one of the big magazines, that furnishes the subject of conversation on a given day. The story, or article, or editorial is then reinterpreted by the group, and the result is encoded in group opinion and perhaps in group action. Thus, it may well be that the chief influence of mass communication on individuals is really a kind of secondary influence, reflected to the group and back again. (page 283)

If interpersonal communications plays such a crucial role, regardless of the format or media in which the information appears, should we not implement careful measures to assure that it is fully utilized in our efforts to improve vocational-technical education? Are not our usual teachers' meetings an example of mass communication? Our memos are another example. Do we allow adequate interpersonal communications to assure internalization of the messages presented in such forms?

Many gaps in this review are obvious. I would only suggest that you may wish to build upon what has been presented by further readings of some of the materials cited. Of the many documents available, four seem especially desirable. The first book I would recommend is Planning for Innovation by Havelock (1969). This presents a thorough review of almost 4,000 documents dealing with change and information utilization from diverse fields of study. The second book, a much shorter and perhaps better introduction to the field due to its brevity, is Managing Change by Rogers and Svenning, (1969). Its major drawback is the concentration on the communications aspect of educational change. The third reference suggested is a collection of readings edited by Bennis, Benne and Chin, 1969 (2nd edition), entitled The Planning of Change. This text serves well as a reference to which one may turn for assistance and guidance in dealing with various elements of the change process. The last to be suggested is Havelock's handbook entitled A Guide to Innovation in Education (1970). This has been mentioned earlier (see pages 9 and 10).

2. Availability of Information

Transmission and utilization of information are necessary conditions to educational change. In many major metropolitan areas of our country, educational systems have developed and implented fine information systems. There are, however, three types of shortcomings which still exist. The first deals with the availability and utilization of information in packet form, e.g., documents.

The ERIC system has concentrated its efforts at the input end of the information system. It has yet to achieve a comparable sophistication at the output or utilization end of the process. I suggest that few agencies at local, regional or state level have filled this gap. (There are some notable exceptions which provide guidelines to those interested in developing such output oriented systems - see Appendix A.)

Not only do we need easier access to the documents contained within ERIC and other similar systems but we also need more effort expended in the interpretation and repackaging of this information for different audiences. How much of a metropolitan school systems budget is devoted to developing materials designed for the specific instructional needs of that community? Could we not easily effect some major changes in our programs by changing materials utilized by our teachers? Are we destined to await the commercial publisher's interpretation of what is "good" for us?

The transmission of information referred to earlier can take two forms: (1) retrieval of information relevant to an expressed need (problems in search of solution) and (2) dissemination of information which has the potential of being useful (solutions in search of problems). Both of these are needed in our field at the present time. Neither is developed to the extent desirable.

Some of the information systems listed in Appendix A provide their services to all, e.g., SEARCH, DATRIX, AND SRIS. This process of retrieving information pertinent to specific problems, however, is best performed in a give-and-take situation. If the system is remote this give-and-take is not feasible. In addition, it is suggested that the greater the proximity of user and information system the greater will be the chance of the user taking full advantage of the services available.

Dissemination efforts could also be improved. Too often we utilize general newsletters to disseminate information to a broad audience. The more varied the audience the less specific we can be in such newsletters. What is called for is a selectivity of dissemination whereby information of a more specific nature is distributed to people in small and more similar groupings. Such a procedure is known as SDI (Selective Dissemination of Information).

In the SDI process both information and audience are indexed with similar descriptive terms. As new documents or other types of information are obtained and indexed they are automatically brought to the attention of that part of the audience identified with similar index descriptors. This announcement takes many different forms but in general is a very brief statement or abstract describing the information. This reduces the irrelevant material a person must scan in a newsletter in order to find the one or two items fitting his special interests. Do the vocational-technical educators in your area have access to such services?

In addition to greater specificity or information designed for key groups and personnel we are in need of the broader, mass media type of communications. It has been found that various types of information play more important roles at various stages of the change process. Mass media for example is called for in creating awareness whereas more specific information is required for the judgement stage.

A second shortcoming, or gap, in our information systems in major urban areas deals with utilization of data for the diagnosis and evaluation stages of the problem solving process. We often find vast record-keeping systems, all computerized and even "mark-sensed" with few people, if any, knowing what all this information is being used for. A brief exploration will often point out its ultimate use - to complete other records which are fed into even larger record keeping systems! (I am presently in the process of examining one aspect of a major city's data information system and have found this to be the case. It boggles the mind to consider the possibility of continuing up the levels of the systems. It must stop someplace. Or does it?)

Generally speaking it is safe to say tha a vast amount of the data collected is seldom used in really meaningful ways. Of the information which is used we generally find an administrator or monitoring agency to be the user. This is certainly justified and needed, but would not greater availability and utilization of data be of help to the practicing educator in the classroom also? I suggest that most of our teachers and supervisors are operating at the present time with inadequate and inaccurate data.

When information systems are developed and installed in our school systems it is usually the administrators who initiate such action. As a result these systems are designed primarily for their benefit. Again I say this is perfectly justifiable but I also maintain that education would be vastly improved if those closest to our students were served by a more relevant and easier to use system of information.

Macro-level data is of little use to the practicing teacher. He needs micro-level data pertinent to his students and to his instruction. Such systems are few and far between at the present time. (In the final section of this paper I will outline a system which could contribute to reducing this deficit.)

The PPBS (Program, Planning, & Budgeting System), the operations research, and systems analysis information services are certainly pertinent systems. Many already have such systems installed. I will not attempt to discuss this type of information system for other papers in this Institute will deal with the topic. I would, however, direct your attention to two systems which I feel are unique and need to be considered in the future.

The first system is being attempted in Wilmington, Delaware by the Division of Urban Affairs of the University of Delaware (Magoon & Tannison, 1970). This project is testing a model which would aid urban decision-makers in the process of allocating their scarce resources among the various public services such as education, water supply, police protection, snow removal, and other such municipal agencies. Its basic premise is to develop a systems analysis which will provide comparable cost/benefit information common to these diverse institutions. I wish them luck!

An even more ambitious undertaking is described in "A Study of Interrelationships Between Education, Manpower and Economy" by Le Vasseur (1967). This paper describes a simulation exercise designed to assist educational planning, on a national scale, based upon a manpower and economic model. Le Vasseur mentions that:

> The strength of the model lies in the fact that it incorporates relationships between education, manpower and the economy within a single, comprehensive framework. All too often eudcational plans are drawn up without consideration of their implications for manpower and the economy. Similarly, economic plans are made without sufficient attention

> being paid to the investments which must be made in education if the manpower required to meet the targets of the plan is to be available when needed. The model described in this paper makes explicit certain structural relationships between education, manpower and the economy which must be considered if consistent planning at the national level is to be achieved. Although it is confined to a global national viewpoint, the span of variables considered includes levels of enrollments in different branches of education, requirements of goods and services for education, the educational qualifications of the labor force, manpower requirements for the economy and the levels of production in the economy. All of these factors are of extreme importance for planning at the national level. (page 13)

Though this model was constructed initially for didactic purposes, it may well prove most useful and feasible in real-life planning activities.

3. Disparity Between Data and Document Systems

Along with our information explosion during the last few decades has developed the field of information science. Extremely sophisticated and complex systems have been developed for storing and retrieving technical data, e.g., PPBS, Project Talent, the US Census, NASA and other. Also exhibiting tremendous strides is the field of document storage and retrieval, e.g., ERIC, DATRIX, Chemical Abstracts, NASA, and others. A major task yet to be accomplished is the marriage of these two aspects into total systems. Attempts have been made and some have been successful. Since the basic principles and practices of information science apply to information, whether in data or document form, it seems entirely plausible to exert more effort to developing a single system which will not only allow each type to be contained within, but will further allow internal interactions between the two types. The computerized similation and gaming projects are perhaps the best examples closest to education.

The most obvious successful marriage of the two systems is illustrated by our space program where alterations in the space systems environment is interpreted and action taken automatically through the use of the programmed computer system. Such sophistication is unlikely to appear in education during the forseeable future, if ever. However, we can improve upon the present disparity which exists between data and document information systems. Again, the model of Directed Learning will illustrate an attempt to move in this direction.

There are many other implications to be drawn from the assessment of information systems as they relate to educational change. Let it suffice for the present to merely reemphasize that society and education are continually becoming more change oriented at the same time that knowledge is growing by leaps and bounds and is being presented to society in ever more immediate ways. Education must tool-up to meet such challenges.

In the last section of this paper is presented a model for Directed Learning which attempts to tie many of these considerations of change processes and information systems together at the most important level of the educational process - the level at which learning is to take place.

Directed Learning

Before moving further let us briefly consider a key term in our considerations to this point - CHANGE. What is change? What is innovation?

I suggest that change is the replacement of X with Y. Change is not alteration though it is a necessary part of alteration. Change is not synonomous with movement though again change is a necessary condition of movement.

If an element which we now call X is eliminated and replaced with an element known as Y then we have accomplished change. If we replace a wood lathe in our shop with a metal lathe then we have changed the lathes and altered our shop. If we have increased out graduate placement record of 65% with a record of 75% placement then we have changed our record of placement and moved in the direction we desire. If a student knows nothing about safe machine operation and we replace this ignorance with appropriate knowledge and skills then we have changed his cognitive and psychomotor make-up relevant to machine safety. Such change is the critical element of learning.

The point being made here is that if we define change as the replacement of X with Y then we have narrowed in on our target and can direct our energies accordingly. Too often we say we will "change" the Vo-Tech Program and become lost in the many aspects of the total program. Instead we should apply diagnostic procedures to narrow in on exactly what part of the Vo-Tech program we want to replace and what it is that we want to see in its stead. Such an orientation will not only help us in concentrating our resources on specific needs but it will also help us in measuring and evaluating our efforts to change. This use of the word change will be further utilized and illustrated in the Directed Learning model.

Another key term appearing throughout this paper is USER. Generally the term user in educational change is perceived as meaning the teacher, supervisor or administrator employed in educational practice. However, who is the ultimate user? Is not the ultimate user in the educational enterpise the student?

I maintain that the ultimate user _is_ the student (individually and collectively) and that any resources expended in the educational process should be justified on the basis of bringing about an ultimate change within the student. Such an orientation to accountability may raise strong objections for the further from a student that resources are inputted the harder it is to measure their effect upon the student. This is certainly true but does not obviate the underlying principle.

The lack of positive relationships between educational resources and student performance as shown by the Coleman report illustrates the reason for fear in using student measures as the ultimate criterion of educational investments. Such negative findings can be attributed to there actually not being any relationship or to inadequacy in measurement. I suggest that both of these are true in various ways. There are many resources in education which have little if any effect upon the student. Also, the measurements used were to a certain extent inadequate. There are few situations in education where we find adequate and accurate measures of student change. Too often we are limited only to macro-level data which fails to adequately describe our stituation. The Directed Learning model attempts to provide a means for obtaining this much-needed information on the micro-level.

The model appearing on the next page (Figure 6) portrays the learning process as an information and change system. I know of no situation in which it is in full utilization but _each part_ is to be found operationally successful someplace.* The description of this model will progress from elements on the left to those at the right. It should be borne in mind, however, that this is both an interaction and circular model, i.e., each element interacts with the others and the model does not end but, rather continually recycles.

A. Information Resources

A truism which is often overlooked is that only that which is known can be taught. Such a statement illustrates that at time X we can only teach what we know at that time. At time X plus, however, new knowledge and information is available. Therefore, if the instructional activities have been designed at time X they are necessarily out-of-date when they are used later in the classroom. An information system must, therefore, facilitate continual input of the new information and the learning system must be flexible to take advantage of these new knowledges. Just as "new" materials are soon out-of-date so it is with our teachers and instructors. If an information system is not structured to allow for continuous new inputs then our teachers and materials will become irrelevant in our modern times of rapid knowledge growth.

From this source of knowledge and information we draw our purposes and objectives of vocational-technical education. Within the information resources are data on manpower requirements; existing private and public training programs; socio-economic data describing trends and predications; surveys reflecting community attitudes and mandates; federal, state and legislative actions; state and local plans and guidelines and many other types of data and knowledge. Also from within these information resources we find the content which will be taught; we also find the order in which these should be learned and information on the various modes through which it can be displayed for learning.

These arrays of information resources serve as the basic fodder for out educational endeavor. The information is available in many forms and

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*A pilot project which closely approximates the model is being tried in the Mineola, New York school system - an ES '70 Project School. In this program they are dealing with the basic mathematical skills required for the Vo-TEch areas of automotive mechanics, electrical technology and business and office practice. The contact person suggested is Dr. Elliot SpacK, Mineola Public Schools, 200 Emory Road, Mineola, New York, 11501.

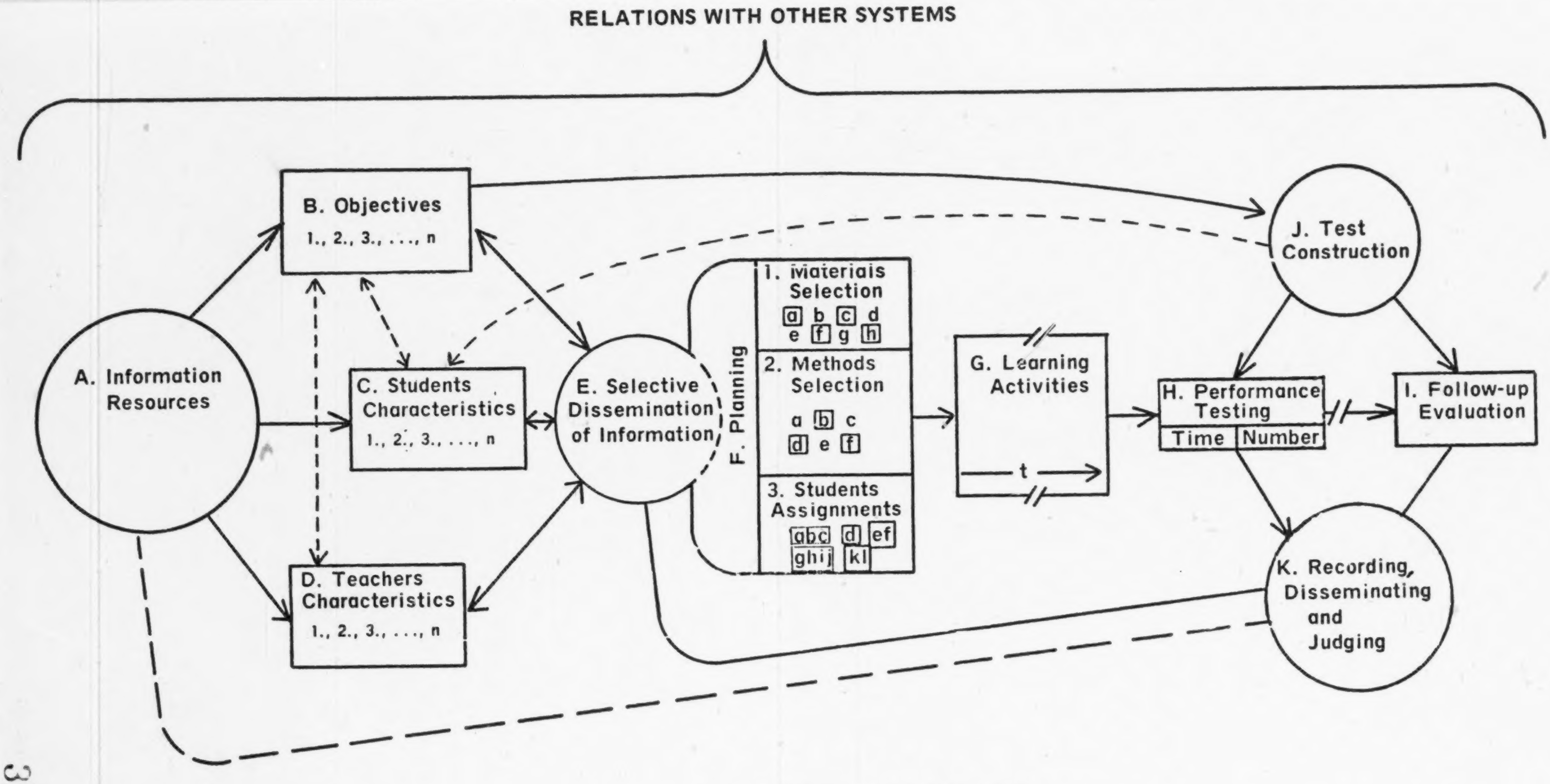
RELATIONS WITH OTHER SYSTEMS
A. Information Resources
B. Objectives
1., 2., 3., . . ., n
C. Students Characteristics
1., 2., 3., . . ., n
D. Teachers Characteristics
1., 2., 3., . . ., n
E. Selective Dissemination of Information
F. Planning
1. Materials Selection
a b c d
e f g h
2. Methods Selection
a b c
d e f
3. Students Assignments
abc d ef
ghij kl
G. Learning Activities
t
H. Performance Testing
Time
Number
I. Follow-up Evaluation
J. Test Construction
K. Recording, Disseminating and Judging

Figure 6. The DIRECTED LEARNING MODEL

formats. The degree of accuracy and validity varies greatly. Not all can be used. The major tasks involve selection of the better materials for use and transmission.

B. Objectives

Speaking of objectives to vocational technical educators is somewhat akin to "carrying coals to Newcastle". There is ample material available providing instruction and rationale in the development and writing of educational objectives. Developing Vocational Instruction by Mager and Beach (1967) is perhaps as relevant as any. There are two points which need to be stressed, however.

The first relates to the specificity of the objectives. Too often we allow objectives which are all too general. As mentioned earlier, in the definition of change, it is most helpful if we become very specific for this aids in narrowing in on our target. If we are to bring about changes on the part of the learner we must know what elements are to be replaced. In addition, we must know which of these elements have already been accomplished by our learners. (These points will be mentioned again).

The second point regarding objectives is that since they become intended learning outcomes we must be able to evaluate the degree of accomplishment of the objectives by the student. These measures, especially in vocational-technical education, should be stated in performance terms. Such performance measures are derived from the occupation(s) the student is preparing for and should be quite similar to the measures employed by that business or industry in evaluating its employees.

Such objectives in specific and measurable terms are key elements of the directed learning model. These objectives not only lead directly to the process of test construction but also interact with the other elements of students' characteristics (C), Teachers' characteristics (D), and recording, disseminating and judging (K). These relationships will be discussed later.

C. Students' Characteristics

The students, both potential and actual, must be described in many ways to facilitate the directed learning process. Most educators are familiar with the types of student information contained in cumulative folders. Such information is desirable and it is helpful _if_ it is used by the student's teachers. Seldom is such use made of these data, however, due to the inaccessability of the information. Greater use would be facilitated by applying more modern information system techniques and processes to the cumulative record system. Additional information of this type should be added as a result of an analysis of the specific objectives mentioned earlier.

A major use of the objectives is to be found in the diagnostic process. Too often we assume that all our incoming students come to us with the same degree of ignorance. Only after we expose them to instruction do we assess their degree of accomplishment. Such evaluation leads us to believe that we have been successful to some degree. How can we claim such success with no information on how accomplished they were before they entered out program? Such pre-post comparisons are helpful in evaluation but even more helpful in the diagnostic process. If we use our specific objectives to describe our incoming students' characteristics* we will usually find great disparities between them. Some will have already accomplished some of the more basic objectives whereas others will need remedial work before we can begin work on the specific objectives. Too often we ignore such differences and search for the common denominator which does not fit either end of the continuum. Thus our more advanced students are held back and become bored, whereas the less advanced find the experience frustrating and drop out physically or mentally. Such student differences will be mentioned again in F3.

Another area of information which is lacking regards the learning styles of our students. Just as they differ on degree of accomplishment of objectives, so they differ on the processes of learning which work best for them. Such learning styles must be assessed and taken advantage of. A slow reader for example might learn much more efficiently in a demonstration than in programmed instruction. A field trip might be most effective for some while it is a boring way to learn for others. Such boredom might lead to habits of inattention which would become detrimental to other learning experiences. On-the-job experience is certainly a desirable learning experience for vocational-technical students but do we really believe that each one needs exactly the same number of years of such experience?

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*Such evaluations derive from the Test Construction (J) element which in turn is derived from the Objectives element.

Learning styles is perhaps one of the least researched areas in education, expecially as such styles interact with other personal and instructional variables. This gap must be overcome not only through experimental lab research but also through multi-variate field research in real school environments.

There are several other types of student characteristics which should be incorporated. The Ohio Vocational Interest Survey illustrates one type which could be included. This survey not only is designed to provide information helpful to the student in the decisions he must make in his process of vocational development. The OVIS is also designed to help the administrator select areas of instructional offerings desired by students. Such a use of the instrument with all students, enrolled and non-enrolled students, should prove most helpful. (Too often we limit our concern to those students presently within our classroom. We must also consider those not in our instructional programs as well as those not within our school system.)

D. Teachers' Characteristics

In a manner similar to that applied to students, it is necessary to know our instructors. Not only do different students learn better in different ways but different teachers teach better in different ways. Such information should be available to the individual teacher as well as the supervisor and instructor. Rather than belaboring this element I would make only one point. We too often feel that a single teacher should possess all attributes necessary to the teaching of a certain subject. Would it not be more realistic to accept that each teacher will have strong and weak points? If such a fact is accepted then we could supplement the weak points with additional resources, both personnel and material, while we take greater advantage of the strong points. Such considerations are especially pertinent to vocational-technical education when we expect an individual instructor to be both expert teacher and experienced technician.

E. Selective Dissemination of Information

Just as we selected earlier from all information resources those most pertinent to our concerns we must now select again from the information on objectives, students and teachers those most relevant to our planning of instructional activities. Various types of information will be relevant in different ways to different persons, therefore, we need a selective process of dissemination. Both the information and the persons involved must be brought together. (The broken line on the right side of the circle indicates that information flows in both directions between E and F1, F2, and F3. Just as information on students, objectives and teachers is meshed within E, so is information on materials, methods and student assignments.)

Information science has developed many ways and means of facilitating the meshing of information according to needs as is suggested here. Many of these are operational in either computer of non-computer format. In the major metropolitan school system combination of the two formats would be most feasible to assure both efficiency and utilization.

F. Planning

The planning of instructional experiences is largely the responsibility of the instructor. His role is to bring together students and materials through various methods so that the student achieves the intended learning outcomes. The instructor may well be a source of these materials, based upon his knowledge and experience, though this is not necessary. Equally feasible is the instructor serving a role as linker between the student user and the materials as resources. This casts the teacher in the role of information manager as well as information giver. Another function of the planning stage is to determine which methods of joining students and materials is most appropriate for which students.

The basic departures from tradition suggested here are (1) more than one source of material should be selected and utilized, (2) more than one method should usually be employed, (3) students should be served in small groups, or individually, based upon their learning styles, competencies, and other characteristics and (4) the systems of information transmission and utilization will need to rely on modern information science to assure effectiveness and ease of the planning process. As mentioned earlier there now exists in operation various programs which match the different elements of the directed learning model. The best known program illustrating this planning element and the learning activities (G) is the Individually Prescribed Instruction (IPI) system located in Philadelphis, Pennsylvania.

G. Learning Activities

The learning activities in which students will participate differ in many ways from the present situation. Some of these differences have been alluded to before. The major difference to be discussed here refers to the time involved. If our intended learning outcomes (objectives) are valid and important then our students should master them. If they are structured appropriately then some objectives, most likely, must be mastered before others. And if our students differ in capacity to master the objectives then it seems obvious that they will also differ in both the number of objectives they can master and the time required for mastery. Thus the length of the learning activity will vary from student to student and from objective to objective. In addition the number of objectives accomplished will vary between students within the same time limits.

To illustrate this we might turn to the field of welding. If some students start the course with the ability to strike an arc and run a flat bead, must they repeat that learning experience while the others catch up? Would it not be more appropriate to expect them to work on more advanced objectives and therefore become more capable welders in the same time as the others take to accomplish the basic elements?

If we prepare performance measures which are valid indicators of mastery of the specific objectives then our students should be allowed to move on to advanced objectives as soon as they perform in the manner required. As will be indicated in the next section the dependent variables of learning will therefore become the number of objectives achieved and the time required to achieve them.

H. Performance Testing

If we can stand behind our objectives as being realistic and desirable then we must accept that some students will be able to advance further and faster than others. To describe such accomplishments we will need to list the performances the students are capable of as well as how long it took to master performance. Such information would be most helpful to a potential employer as well as the school system. It would not only describe the student but would also provide evaluative data on the materials and methods utilized in the instructional process.

I Follow-Up Evaluation

This element of the model occurs at some time(s) following initial evidence of mastery. It might be at the end of the school year to assess retention, or it might be on the job to assess retention again, or more likely to assess relevancy of the instruction to the real world of work. (Such evaluations should be conducted more than once).

J. Test Construction

As mentioned earlier the measures of mastery are derived directly from the specific objectives. The more specific the objectives the better the test item construction. Not all measures of mastery are amenable to statement in behavioral terms. Those which are not will need to be justified on theoretical or correlative terms. This process of test construction leads not only to post-test use but also to use as a diagnostic instrument describing the students prior to the learning activites.

K. Recording, Disseminating and Judging

This last element of the model is actually a beginning point. Such information and judgements as is now available to describe the existing educational situation is incorporated into the initial Information

Resources (A) as well as the Selective Dissemination of Information (E) systems. These bits and pieces of information must be studied both individually and in conjunction with others for change will be facilitated as we are able to increase the degree of specificity.

Such evaluation and reporting as is envisioned here will require several alterations in existing practices. Such questions as how do you rank students in a class when each is working individually may cause some headaches. The more effective this model is made the more individual will be our methods of reporting judging. Such individuality may be seen as increasing the amount of work required. This should not be the case if the proper information systems are utilized appropriately.

Summary of Directed Learning Model

Again this paper has presented an abbreviated view of this model. It is hoped that enough insight has been provided that you may expand and further develop the conceptual nature of such a system. There are several points, however, which I will emphasize.

1. The Directed Learning model may best be perceived as a set of integrated information systems. Each system interacts with each other system and contributes to and draws upon the other. Such systems are designed to both contain information and transmit the information contained. Relative priorities between these two aspects of storage and transmittal cannot be assigned since both are necessary conditions and neither is a sufficient condition to an effective information system.

2. Implementation of this model would cast the teacher or instructor in the role of knowledge linker (see page 10) rather than knowledge giver. Such an alteration in roles may be difficult to implement at first but once such a reorientation is established further improvement will come more easily. The field of vocational-technical education already has experience in utilizing outside resources. Such experience must be built upon and made explicit.

3. The reporting and evaluation procedures suggested are much more amenable and appropriate to the world of work than our present system, of graduation/non-graduation. Such specificity in reporting students'

competencies will be welcomed by business and industry. More difficulty will be welcomed by business and industry. More difficulty will be incorporated in the articulation between public school and higher education.

4. As a system of this nature becomes more sophisticated we will be able to conduct more meaningful research. Such a system will facilitate both multivariate and longitudinal research within actual field conditions. Such research is very difficult to implement within our present systems. When multivariate and longitudinal research projects are possible we will find the results to be much more directly relevant to our educational practices.

5. Another advantage which this model provides is the ability to generate additional data and information on the system itself. Such supra analyses will allow for continual analysis and improvement of the system as well as the elements within the system.

6. Once a system as described in the Directed Learning model is implemented it will be easier to introduce new changes. Such a model allows interjection of new practices at almost any point. Such interjections may vary in degree of specificity and therefore facilitate more valid assessments of the changes made and the interactions such changes cause.

7. The Directed Learning model is a dynamic system. It will never be complete; therefore, we must start with what we now have. Such an orientation allows one to start with any degree of sophistication. Cooperative ventures between programs and schools would facilitate easier and faster implementation. Such cooperative ventures are being tried and are found in many cases to be successful. Coperation of this type would reduce the total costs involved in any one system.

Summary

In this paper I have attempted to relate the conceptual aspects of educational change and information systems to a suggested model of the educational process. The emphasis has been to illustrate the commonalities existing between these three phenomena toward the end of facilitating greater reliance upon each in the vocational-technical programs in major metropolitan areas. It has not been the intent of this paper to provide specific technical guidance but rather the general conceptual framework from which further study and action can be launched. I hope this paper has resulted in seducing some of the readers to continue further study and action. (See Appendix B for additional suggested readings.)

Information transmission and utilization is a necessary element of any planned change in education. In this paper it was maintained that education itself is an information system and would benefit from a greater reliance upon the more modern techniques of information science. No matter what perspective is taken to the process of planned change in education; whether it be the Research Development and Diffusion model, the Social-Interaction model, the Problem-Solver model, the Linkage model, or one of the reader's own choosing, the fact remain that information transmission and utilization is of signal importance.

The model of Directed Learning was presented as one approach of providing an integrated and interactive method of information transmission and utilization designed to foster and facilitate the planned change process in vocational-technical education. The Directed Learning model is suggested as amost feasible and workable approach to designing and implementing change for the benefit of educations ultimate user - the learner. It remain for you, the leaders in urban area vocational-technical education, to bring suchan information system into being, so that our teachers and learners may accomplish the goals we all so ardently strive for!

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Schramm, Wilbur, "The Nature of Mass Communication" in Selected Educational Heresies, William F. O'Neial (Ed.), Glenview, Illinois: Scott, Foresman and Company, 1969, pp 281-288.

Thelan, Herbert A., "Concepts for Collaborative Action-Inquiry," Concepts for Social Change, Baltimore, Maryland: Moran Printing Service, Pulbished by NTL, National Education Association for COPED, March, 1967, pp. 37-47

Watson, Goodwin, "Resistance to Change," in Concepts for Social Change Baltimore, Maryland: Moran Printing Service, Published by NTL, National Education Association for COPED, March, 1967, pp 10-25.

APPENDIX A

Document Retrieval Systems

Listed below are a selected number of document retrieval systems presently in operation. Some of these systems are more successful than other but all illustrate various attempts to fill the void which now exists in document retrieval in education.

1. SEARCH, Center for Occupational Education, One Maiden Lane, Raleigh, North Carolina 27607.

   SEARCH will retrieve, via computer, all documents contained within the ERIC system. This service is available to all vocational-technical educators throughout the nation. A minimum charge is made. To obtain a search one needs only to write to the address above stating the nature of the problem for which information is desired.

2. SRIS (School Research Information Service), Phi Delta Kappa, International Headquarters Building, Eigth and Union, Bloomington, Indiana 47401.

   SRIS is funded by the Kettering Foundation and works in close cooperation with the ERIC system. It attempts to obtain documents developed by local school systems and will answer search queries in a manner similar to that outlined in SEARCH. A minimum charge is made.

3. DATRIX, Xerox Corporation, Ann Arbor, Michigan 48106.

   The DATRIX system is the computerized search facilities of the University Microfilms. Through use of Keywork Lists provided by DATRIX a user may construct his own search with various logics. A charge is made for each search based upon the number of dissertations identified. To obtain the Keyword Lists and order forms send to the address above.

4. Several local retrieval systems have been implemented during the last few years. A letter to any of them will obtain a description of their services and experiences.

   a. ARIS

      Ohio Education Association
      225 East Broad Street
      Columbus, Ohio 43215

b. The ASSIST Center
33030 Van Born Road
Wayne, Michigan 48184

c. RISE
443 South Gulph Road
King of Prussia, Pennsylvania 19406

d. Community Resources Project
Boulder Valley Public Schools
P.O. Box 186
Boulder, Colorado 80302

5. One of the most critical parts of information retrieval is identifying the relevant information sources and services. A most helpful service designed to do just that is the National Referral Center for Science and Technology. Despite the name, this center is equipped and willing to respond to questions in the social sciences including education. A letter or telephone call to the Center will obtain the name of sources relevant to the problem. The address is:

National Referral Center for
Science and Technology
Library of Congress
Washington, DC 20540
(Phone: (202) 967-8265)

APPENDIX B

Additional Suggested Readings

Below are listed several readings which may be of benefit to one wishing to pursue the subjects of this paper in greater detail. The items in the bibliography are also to be considered.

Bushnell, Don D. and Allen, Dwight W. (Editors), *The Computer in American Education*, New York: John Wiley and Sons, 1967, 300 pp.

Fascione, Daniel R. and Penry, Edward B., "Establishing a Pupil Data Bank: Conflict Between Theory and Practice," Paper presented at the 1970 Annual Meeting of the American Educational Research Association, Minneapolis, Minnesota, March 4, 1970

Fascione, Daniel R. and Schwarts, Jack, "Survey Research in Public Education: A Cheaper and Better Process," Paper presented at the 1970 Annual Meeting of the American Educational Research Association, Minneapolis, Minnesota, March 4, 1970.

Flanaga, Dennis (Editor), *Information*: *A Scientific American Book*, San Francisco: W. H. Freeman and Company, 1966, 281 pp.

Havelock, Ronald G., "Assembling the Pieces of the Educational Revolution," An Address to the "President's National Advisory Council Conference on Innovation" in Washington, DC, March 31, 1970. Available from President's National Advisory Council on Supplementary Centers and Services, 201 Taylor Education Building, Lexington, Kentucky 40506.

Kazamias, Andres M. and Massialas, Byron G., *Tradition and Change in Education*, Englewood Cliffs, NJ, 1965, 182 pp.

Kent, Allen, *Textbook on Mechanized Information Retrieval*, Second Edition, New York: Interscience Publishers, - A Division of John Wiley & Sons, 1966, 371 pp.

Moore, Wilbert E. *Social Change*, Englewood Cliffs, NJ: Prentice-Hall, Inc. 1963, 120 pp.

US Department of Labor, Putting Research, *Experimental and Demonstration Findings to Use*, Washington, DC: Office of Manpower Policy, Evaluation and Research, Manpower Administration, US Department of Labor, June, 1967, 71 pp.

SYSTEMS ANALYSIS AS AN INSTRUMENT FOR CHANGE IN URBAN EDUCATION

Prepared for:

INSTITUTE IX

METROPOLITAN AREA APPLICATION
OF
VOCATIONAL EDUCATION INNOVATIONS
RESULTING FROM
RESEARCH AND DEVELOPMENT PROGRAMS
Albuquerque, New Mexico

by

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SYSTEMS ANALYSIS AS AN INSTRUMENT FOR CHANGE IN URBAN EDUCATION

It has been the best of times and the worst of times for the urban educator during the past two decades. Average per pupil expenditures have gone from approximately $209 to $766. School enrollments have increased 80% while school revenues have risen 350%. Viewed from the perspective of the return on the dollar invested in education, labor economists have become convinced that this rising investment in training and education can account for a disproportionate share of our economic growth. Others view education as the primary tool for insuring economic security and job stability. The recognition of education's role in maintaining and enhancing the skill and adaptibility of our nation's labor force has put increased pressure on educators to discover more effective ways of coping with the demands and frustrations of our hitherto disenfranchised and economically disadvantaged groups who have not been effectively served through public education.

This year's rash of riots and protests have put educators on notice that no longer will those who are the supposed beneficiaries of the public school systems, particularly the urban disadvantaged, accept uncritically the prescriptions of the professional educator. The dilemma of the large city school system has been well-documented. The migration of low-income groups into our cities, the shrinking tax base resulting from out-migration of higher income groups and industry, and the increasingly militant demands for more relevant educational programs sum up the forces conspiring to overwhelm the professional urban educator. It is not my purpose, however, to chronicle the economic and demographic problems besetting urban education. The problem is not primarily higher per pupil expenditures, lower teacher-pupil ratios, or better facilities; the problem is how to overcome the infirmities rising out of the increasing institutional rigidity which has made our public school system less and less responsive to the needs and demands of its students.

There is growing evidence that our educational institutions have not kept pace with the requirements of a computer-based, post-industrial society. For example, the rise in service occupations, accompanied by a corresponding need for employees with writing, listening, speaking and reading skills, has put a premium upon communications courses which were not as much in demand during the earlier era of a production-oriented society. Inter-personal skills such as those required to establish and maintain open and effective communications links with customers must somehow be acquired before one can qualify for many of today's employment opportunities. Unfortunately, the product of our urban school programs, even those who graduate, can be characterized as having achieved a low level of verbal fluency. They carry away with them little in the way of motivation for continued learning beyond high school. Many students leave the present-day system scarred and frustrated. What should have been the joy of discovery and personal achievement has been superseded by the dissillusionment of failure.

Past attempts at school improvement have tended to deal with small fragmented pieces of the total learning environment. Those responsible for imprementing changes in our educational system are beginning to recognize that each of the sub-systems making up that environment must be viewed as part of a larger or total system. Unless a more holistic approach to educational change and innovation is undertaken, attempted improvements in one or two procedures within a given school system tends to create ripples which threaten those with vested interests in the more conventional procedures, thus generating resistance to the proposed change. Modifications in one part of a total structure may result in barriers to change in other parts of the structure.

Matthew B. Miles in his book Innovation in Education[1] makes the cogent observation that many experimental programs within a larger system fail because the change or innovation is perceived as creating too much disequilibrium in the system, thus preventing it from meeting its obligations in a well-ordered manner. Goodwin Watson, in the monograph Concepts for Social Change,[2] states that "a change in teacher -pupil relationship is likely to have repercussions on teacher-pupil interaction, on parent-principal contacts, on pressure groups operating on the superintendent, on board members' chances for re-election, etc. Any estimate of resistance which considers only the persons primarily and centrally concerned will be inadequate . . . . repercussions elsewhere may be even more influential in the survival of the innovation."

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[1] Miles, Matthew B. Innovations in Education. New York: Horace Mann-Lincoln Institute of School Experimentation, Teacher's College, Columbia University, 1964.

For this reason, small scale curriculum development efforts, such as those which have traditionally been employed by those concerned with updating vocational education, are likely to have little impact in a specific school district because they deal with only a small part of the total learning process. More massive approaches, both in terms of funding and effort, linking various suggested improvements together in a coordinate manner, offer greater likelihood of success if handled in a systematic way. Few adventuresome souls have been willing to tackle the need for improving curriculum content, instructional procedures, and for modifying teacher and administrator roles, all at the same time. Yet this is probably what is required if significant improvements are to be achieved.

Fortunately, there is a relatively new analytical approach which offers us a means for systematically manipulating the important learning variables and assessing their significance in modifying a student's performance. Systems analysis, variously labeled as "operations research" or PPB (Planning, Programming, Budgeting), of course, is not a new or magical formula for guaranteeing improvement in the productivity of our schools. Most of us are aware of the benefits derived from applying this analytic technique to the design and implementation of training programs in military and industrial settings. The systematic projection of manpower needs by industry makes it possible for them to anticipate and implement the necessary in-service training programs such that those needs could be met without undue dislocation of existing personnel or skill shortages. Whether or not this same rational decision-making procedure can be adapted to the needs of the urban educator warrents further investigation. This focus is the central concern of this paper.

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[2] Watson, Goodwin. "Resistance to Change" in Goodwin Watson (ed.) Concepts for Social Change. Published by Cooperative Project for Educational Development (COPED), National Training Laboratories, NEA, Washington, DC, 1967

Is a Systems Approach in Education Possible?

Before attempting to argue that systems analytic techniques have a legitimate place in vocational education planning and improvement, let me first recognize that there are significant differences between educational systems and other systems. When we introduce a new math curriculum into a local school district, for example, a whole host of problems crop up which are unlikely to be found if we were attempting to improve or update a military training program. Students in our local school would find it hard to grasp the new terms and parents would be frustrated because they could not help their offspring. Teachers would be frustrated because, more likely than not, they would not have been taught to handle the process of "inquiry" or problem solving required. The principal would be frustrated because of his concern that his students would not measure up on standard achievement tests which had not been modified to reflect the new curriculum. Even regional accrediting groups responsible for quality assurance would be required to conduct extensive studies and to modify their criteria to reflect such changes in course content.

There would be other problems. The School Board would be hard put to make appropriate choices between the expenditures required for implementing this new course offering or getting by with an existing one. Objective evidence supporting the long-term advantages of the new math curriculum would be difficult to come by because publishers do not offer such data.

The military training command, on the other hand, focuses on the training of its personnel to a specific level of competence for a specific job function. Until recently at least, dollar and other necessary resources were not a primary concern. Most recruits were reasonably well motivated and had some degree of assurance that if they met the military's performance standards, they would be assigned to the occupational category for which they were trained. Proficiency of the job incumbent following training would be monitored with instant feedback to the responsible training command resulting in continuous improvement of a given training program.

This brief comparison is meant to establish how the level of complexity differs between the more centrally-controlled military establishment and the decentralized and locally managed school district. Participation in and consensus arrived at through active involvement of the diverse interest groups who have legitimate roles to play in the planning and implementation of educational programs at the local level must be achieved if educational reform is to be effective.

The Promise of Systems Analysis

By bringing these new analytical skills into the realm of education, many hope to insure that reform efforts can shift from philosophical theorizing to a more hard-nosed, empirical approach. A systems approach requires that: 1) educational goals be set forth in specific quantifiable terms (performance specifications); 2) alternative strategies and constraints be presented and evaluated; 3) the best alternative selected and implemented; and, 4) the results evaluated and the system mofified depending upon the results achieved.

Past efforts at stating educational goals have been largely limited to expressing them in vague or general terms which offer little value for measuring the relationship between specific practices and their contribution to the achievement of the broader goals. In breaking down the more general goals into sets of performance objectives that circumscribe learning tasks for individual students, it becomes possible to evaluate the specific instructional practices in terms of their impact on the student's performance. In addition, restating goals in terms of more specific objectives opens up the possibility of incorporating a whole new array of instructional procedures or materials, because their effectiveness can be demonstrated.

Performance objectives can be classified into two categories: terminal and interim. "Terminal" performance objectives are those which describe the end results of a formal educational program. For example, a high school graduate should be able to state his own personal and vocational goals, he should have developed his interpersonal and social skills, he should be able to continue to acquire knowledge and apply it to new situations, he should have the necessary skills and abilities necessary to function as an adult, and he should be able to manage his future self-development in implementing his life goals. "Interim" objectives are those which additively make up the more permanent terminal skills. For example, the recent report of the National Advisory Council on Vocational Education urges that career interests and awareness be introduced at an early stage in the child's development. These exploratory programs should then lead to a more focused, job-related instruction at the middle grades. Those students planning to terminate at the end of high school would thus have had the opportunity to explore in depth a number of occupational culsters and should have selected that culster in which they would like to specialize.

An increasing number of school districts are engaged in the writing of specific performance objectives in precise and measurable terms. These districts have successfully differentiated their broader educational goals from the more specific terminal and interim performance objectives and have begun to evaluate their present practices and resources allocation procedures. It is vitally important that they understand the difference between the traditional "input-oriented" planning and budgeting procedures which have been employed in the past and "output-oriented" procedures based upon observable changes in a student's behavior. Many of the more accepted practices of allocating space, apportionaing time, assigning students, and even the purchasing of materials have been shaped in a way which would facilitate the performance of the teacher, but not that of the student. Student failures were attributed to lack of motivation, stupidity, or just plain cussedness. By requiring teachers to state their instructional objectives in operational terms, many have become aware of what a "learner-oriented" instructional system really means. It often times forces the instructor to reevaluate his previous procedures and materials in light of the results. As the teacher attempts to develop better means of implementing his objectives, the implications of this systematic approach to planning and its impact upon organizational structure and management procedures becomes increasingly apparent.

Characteristics of Well-Stated Objectives

Educational objectives, as described above, may represent the end of an action or an intermediate step directed toward some distant goal. The characteristics of well-stated objectives can be summarized under eight criteria as follows:

1. The objective should be stated in operational terms. By stating an objective in precise, "action-oriented" terms, one can avoid the vague imprecision associated with such words as "demonstrate a knowledge of" and "show appreciation for". Action words such as "describe", "identify", and "list in writing" lend themselves to the description of overt behaviors which are capable of being measured against some standard.

2. Describe what is to be done and how it is to be done at what level of acceptable performance. A well-stated objective might, for example, be to require that a student be able to complete a 100-item multiple choice test on principles of management by objectives. The lower level of performance could be set at 85 items answered correctly with the specification that the student complete the test within a 90-minute time period.

3. They should be internally consistent. By taking a systems or wholistic point of view, one can assess the internal consistency of one set of objectives against another, thus helping to avoid unnecessary overlap, redundancies, or conflict.

4. Objectives must be consistent with what is intended or is being accomplished. Determining the consistency between the statement of an objective and what it is actually trying to achieve requires expert judgment. If the objective does not capture the essence of what the program is directed at, then we may be engaged in an exercise in futility. If, for example a regent's examination becomes the goal toward which many teachers orient their curriculum, the teacher will want to make very sure that the examination items actually represent the adult skills and performance capabilities that college graduates will need in order to play their roles as future citizens, parents, and workers.

5. They should be comprehensive. Emphasizing a selected set of objectives and ignoring others may bring about a failure in the achievement of the more significant aspects of a given program. Where possible, both the anticipated and the unanticipated consequences of an action should be

identified. For example, students who are requested to employ a programmed instructional procedure in the achievement of some specific objective may very well lose whatever creative and inductive reasoning ability they might acquire through following this prescribed sequence of small steps developed for the program.

6. Objectives must provide for individual differences. Tailoring objectives to the individual needs, interests, abilities, and background of the student may help to optimize the chances of success of an individual pupil. Each student's performance should be evaluated with respect to how he is doing in light of that objective tailored specifically for him.
7. Objectives must be phrased in realistic terms taking into account limited resources, traditions, and other constraints. Constraints may take the form of state laws governing the practice of education, shortage of school teachers, or a failure of the state legislature to appropriate funds. Resources include people, facilities, and, of course, money. When objectives are established, there must be an understanding of the real constraints and resources available for the achievement of those objectives.
8. Objectives must be reachable but ambitious enough to be challenging. A given objective should be just far enough out to be challenging but not so far out that it can never be achieved.

Objectives could be classified in terms of "facilitating objectives," "instructional objectives," or "institutional objectives." Or we could group objectives in terms of the various sub-systems which make up a school district, such as the financial or the administrative sub-system. For purposes of this paper, we will be primarily concerned with linking "instructional objectives" to procedures or instructional strategies in a systematic way. As we have seen, instructional objectives can be broken into "interim" or "terminal." Specific units of instruction (interim objectives) are comprised of the more immediate day-to-day activities which teachers assign to students as they progress through a given course or subject matter.

Assuming that we have successfully specified the goals and instructional objectives of a given school district, what else must be done to bring about systematic changes in an ongoing educational program? Few educators, until recently, have been capable of even specifying what it is they are trying to accomplish in their school programs. Given a better understanding of how to state specific performance objectives in operational terms, we are now ready to attempt to assess the relationship between these objectives and the instructional process. Perhaps for the first time, many of you will now be able to link the goals and the means of your school district by analyzing current practices (and alternative practices) in a systems or "output" oriented manner.

Systematic Strategies for Change

Assuming for the moment that learning represents the total impact of the learning environment on the learner, careful attention must be given to anticipating the consequences of manipulation of one variable upon the rest of the environment. By dealing with the total system, we put ourselves in the position of being able to evaluate the interactive effects of one change upon another. Thus ways and means must be found to simulate the impact of a total system change effort before the system itself is actually required to adopt a given innovation. Conversion from an old program to a new one should be discussed in terms of several linking functions which permit the simulation or trying out of various alternatives before tackling the conversion of the total system itself. This way, hopefully, we can deal with the overall impact of a new program while minimizing its negative impact and optimizing our chances of success.

There are any number of problems faced by vocational educators in the urban setting which require a coordinated, systematic problem-solving approach to achieve a satisfactory resolution. Among them are: Improved methods for matching programs and linking vocational students with emerging job opportunities; the recruitment, selection, preparation, and updating of vocational teachers, many of whom are long on occupational experience, but short on teaching skill; improved administrative and organizational practices leading to the more efficient allocation of scarce resources available to the vocational educator; and better ways of matching student abilities, interests, and learning styles with instructional materials tailored to their requirements.

Within the limits of this paper, each of these six areas will be discussed briefly:

1. Matching Students With Job Opportunities

Most vocational coordinators, guidance counselors, and curriculum planners are concerned with finding better ways of anticipating the demand for new skills in emerging occupational fields. From that step to the implementation of relevant training programs should be just a short hop. The experience of local school districts indicates that the matter is considerably more complex, however,

The demand for vocational programs in new occupational areas seldom develops independently of existing labor market and institutional arrangements for training. If a vocational teacher were to offer a new program for the training of sub-professional personnel in the field of social work, for example, he would probably do so after a thorough-going analysis of present skill requirements and job functions. Extensive restructuring of the professional's job, so that sub-professional responsibilities could be identified, may also be required. Before a new vocational program can be launched, it frequently encounters opposition from those with vested interest in similar occupations or from practicing professionals who are reluctant to accept potential competitors into their filed. New vocational offerings sometimes encounter accreditation and licensing difficulties. Placement of graduates may prove to be difficult. Even the more routine chores of persuading school board members, superintendents, and other holders of the purse strings that investments in a new and untried occupational training program may prove troublesome. To compete with alternative curriculum investment opportunities and to ensure an accurate and up-to-date inventory of a particular mix of skills representing a potential area of employment requies a systematic procedure for surveying, storing, up-dating and retrieving massive amounts of detailed job information in a form which is useful to vocational curriculum planners. The capacity of the modern computer is one of the few alternative ways to really grapple with this massive informational problem.

An excellent illustration of the use to which a computer can be put as an inventorying and monitoring device is that described by Dr. Raymond Christal[3] of the Occupational and Career Development Branch, Lackland Air Force Bse, Texas. Information has been collected by means of mailed questionnaries sent to large numbers of military personnel who are asked to describe their jobs in detail by checking and rating statements in the inventory. The data received is then analyzed, classified, and coded. A computer-based occupational information retrieval system enables curriculum planners to easily retrieve information needed in structuring new training programs and evaluating existing ones. For example, information on the probability that individuals entering a particular occupation will be required to perform specific tasks within a given time period after graduation from technical training can be obtained. Periodic retraining and up-grading can therefore be planned accordingly. Hierarchical clustering of task functions common to a variety of occupations can also be identified for the purpose of culstering these functions into a training program. Outmoded content can be eliminated from the training courses through periodic surveys of incumbents.

The ability to provide students, guidance counselors, and curriculum planner with detailed job information makes it possible not only to keep training programs current or plan new programs, but also aids students in making appropriate carrer choices. The work of David Tiedeman[4] and John Flanagen and his staff[5] has led to the design of computer-based guidance systems which enable students and counselors to readily obtain career information in such a form that students can compare and estimate their own chance of success in a given occupational pursuit.

The guidance system in Flanagan's Project PLAN is directed at weening

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3. Christal, Raymond E. "Implications of Air Force Occupational Research for Curriculum Design." Paper presented at the Invitational Conference on Curriculum Development in Vocational Education, University of Minnesota, Minneapolis, Minnesota, March, 1970 (Report in press).

4. Tiedeman, David V., et. al. Phase I--Conclusion of the Information System for Vocational Decisions, 3rd Report, 1968-69. Published by Harvard Graduate School of Education, Cambridge, Massachusetts, October, 1969.

5. Flanagan, John C. "Individualizing Education." Paper presented to Division 15, American Psychological Association, San Francisco, September, 1968.

youngsters from teacher-directed learning experiences to self-directed learning experiences. Part of this involves helping the student to arrive at realistic choices in his career plans. Each individual is given the opportunity to compare his interests, abilities, and program of study with former students having similar characteristics who have actually entered into a given occupation. Career information is obtained from a data bank on approximately 500,000 students who participated in a ten-year follow-up study (Project TALENT) launced by Flanagan in 1960. The role of the computer in Project PLAN is that of providing appropriate information to teachers and students in addition to other record keeping and scheduling functions.

The Tiedeman computer-based guidance system also offers students the opportunity to make judgments about their chances of success in a chosen occupation, but in addition, it permits guidance counselors to prescribe for and counsel students on appropriate learning experiences which will lead systematically to the attainment of a relevant set of occupational skills. The computer is programmed to provide the counselor with detailed dossiers on in dividual students and assists counselors in diagnosing student needs and monitoring their progress. The Tiedeman system was brought to the prototype stage after several years of research effort, but is still in need of field testing in one or more "on-line" schools.

2. Vocational Teacher Preparation

One of the more critical observations of the report to the President by the Commission on Instructional Technology[6] was the failure of teacher trainers to familiarize new teachers with the use and operation of instructional aids. Vocational instructors are particularly in need of this type of experience because many of them receive a minimum preparation of their roles as instructors. When prospective teachers are trained to develop lesson plans and outlines, many are not taught how to incorporate appropriate instructional methods or enrichment materials into their curriculum guides.

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6. Commission on Instructional Technology. To Improve Learning. A Report to the President and Congress of the United States Before the House Committee on Education and Labor, March, 1970. Superintendent of Documents, U.S. Government Printing Office, Washington, DC.

A number of dramatic efforts are being made to upgrade the teaching ability of both vocational and academic teachers. The US Office of Education mounted a comprehensive attack for the purpose of upgrading teacher education in this country three years ago by funding the development and implementation of nine models for pre-service teacher preparation at the elementary level. Each institution selected from among a number of applicants was asked to build a systematic approach incorporating individualized instructional procedures and technology.[7] These programs are now in the process of being implemented at the various institutions responsible for structuring the initial planning phase.

3. Administrative and Organizational Applications

A third application of systems analysis which holds great promise for revolutionizing school management procedures borrows upon the modern management methods now employed by industry and the military. By bringing these management techniques into the realm of education, many hope to accelerate the process of making schools more "accountable" in their use of resources and facilities. A systems approach, as we observed earlier, requires that educational goals be set forth in quantifiable and objective terms so that the cost of specific programs and practices can be measured against the results achieved. In the past, school administrators contented themselves the thought that traditional school organizational concepts, space allocations, apportionment of time purchase of materials, and allocation of resources (both teachers and materials) actually facilitated what they thought was an efficient and effective teaching process. By concerning ourselves now with demonstrable improvements in student performance (the "output" of the system), we can judge a school on its results rather than in terms of "this is the way we've always done it."

The Philadelphia School District, under the direction of Oliver Brown and with the assistance of Price Waterhouse and Company has adopted planning, programming and budgeting (PPB) to their preparation of an annual budget.[8]

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7. See the Journal of Research and Development in Education, Vol.II, No. 3, Spring, 1969, Athens, Georgia, for a description of eight of the nine models.

8. Rappaport, Donald. "New Approaches in Public Education." New York: American Institute of Certified Public Accountants.

The Professional staff prepares the budget along programmatic lines for the superintendent annually; he then approves or revises it before sending it on to the board. The board reviews the document with appropriate community representatives before its adoption and makes every attempt to see that the system-wide goals are, in fact, compatible with the specific goals of programs to which they allocate resources. Present and new programs are assessed in terms of their contribution to the improved prrformance of students. By grouping expenditures in terms of programs and activities, the accounting and financial reporting system in Philadelphia has been synchronized with the program budget.

A second undertaking directed by Walter J. Foley[9] and sponsored by USOE is designing a plan for utilizing modern management techniques to facilitate the goals of a learner-responsive school system. This management information system is being developed to meet the need for the coordination of staff resources, facilities, and time within the long-range planning and financial management efforts fo a network of 20 innovative school districts.[10] The development of a common data base the construction of a program monitoring system, the design of a management simulation and modeling capability represent the three major missions of this undertaking.

4. Individualized Instruction

An event of considerable interest to practicing educators is the recent development of individally prescribed instruction (IPI) designed to adapt to the ability levels and learning styles of students of varying backgrounds and aspirations. Recognizing that students learn at different rates and in different ways, proponents of the IPI system argue that 90% of our present-day student body is capable of mastery of most subjects, provided they are given an opportunity to participate in a learning program tailored to their individual needs. Achievement of this goal of optimal learning requires a raft of new teaching materials and methods, administrative procedures, and organizational patterns, as well as profound attitudinal changes on the part of teachers and administrators.

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[9] Foley, Walter J. Mission and Goals Statement of the IEIC Management Information System. Iowa City, Iowa: Iowa Educational Information Center, The University of Iowa, September, 1969.

[10] For a fuller description of the goals and strategies employed in the implementation of a systematic change program for the 20 school disctricts, see Bushnell, David S., "An Educational System for the '70's; "Rhodes, L. "Linkage Strategies for Change: Process May Be the Product;" and Popham, W.J., "Focus on Outcomes: a guiding Theme of ES '70 Schools" in Phi Delta Kappan. Bloomington, Indiana, December, 1969. pp. 199-210

The teacher in the IPI program is still at the heart of the system, but she takes on new responsibilities, such as evaluating individual student status, prescribing learning sequences, monitoring progress, testing, and repeating this same cycle as the student moves from lower level skills to higher levels. In some applications, the computer has been employed as a back-up system. The Naval Academy at Annapolis, Maryland,[11] has demonstrated the feasibility of self-study, multi-media programs in an institutional setting. The Annapolis project, financed jointly by the US Office of Education and the Department of the Navy, has successfully field tested a computer managed instructional system in three subject matter areas covering the first semester of the freshman year at the Academy. Two of the three courses are vocational in orientation.

Successful learning experiences tailored to the needs of vocational students are helping to overcome the negative feelings toward learning which many disadvantaged urban students currently evidence. As an example, the Minneapolis Work Opportunity Center[12] offers potential dropouts combined work-study opportunities on an individualized basis making it possible for them to complete their high school requirements while at the same time acquiring saleable job skills. In the Judson School at Hudson, Ohio,[13] below average students have been permitted to study at their own pace and are urged to help their fellow students on a tutorial basis in overcoming

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11. For further information on the Naval Academy Project, contact Dr. Richard Otte, National Center for Educational Research, USOE, Washington, D. C.

12 and 13. For further information on these two projects write directly to the Directors at each location or to Dr. Elizabeth Simpson, National Center for Educational Research, USOE, Washington, D. C. Copies of the final reports on both projects should be available shortly.

particular hangups. Success in both situations has helped to reinforce the sense of competence and the degree of control these students feel over their own destiny, an outlook which we know to be an important ingredient in any successful working career.

5. Simulation and Trouble Shooting

Perhaps the most extensive use of instructional technology in a systematic way by the vocational-technical educator employs the same equipment, materials and processes that a trainee will confront when he takes on a given job assignment. Because much of this "on-line" equipment is not suited to instructional purposes (such as safety, cost, or space considerations), simulated equipment is substituted. Often the instructor making the selection of such equipment does so because of the unavailability of funds or because the equipment's simplicity makes it easier for him to develop appropriate skills on a simpler training device. A number of studies have shown that students taught to operate even outmoded equipment can transfer their skills to production equipment in a relatively short period of time.[14]

Among the newer instructional procedures to be employed in vocational-technical education is the use of a small computer to simulate defects in a trouble-shooting exercise. Bryan[15] describes a technique requiring the student to make systematic tests using a schematic diagram in order to find the cause of improper equipment performance. As the learner develops his diagnostic skills, the level of difficulty in searching out the simulated defect can be increased. A greater variety of diagnostic exercises can be provided through this simulation procedure.

6. Continuing Education

Changes in job skills and content has become almost a way of life in most occupations. Initial employment skills need to be upgraded and revised in order that employees can adapt to technological advances. The retraining of workers whose skills are in danger of becoming obsolete has become an important part of the nation's effort to maintain the current level of employment and rate of economic growth.

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[14] Eninger, Max. Vocational Educational, Process and Product. Pittsburg: American Institute of Research, 1966.

[15] Bryan, Glenn L. Computers and Education. MIT Symposium Series May '68

Training effectiveness has been hampered by inadequate adult teaching techniques and the unwillingness of many skilled workers to expose themselves to new training experiences. For some the prospect or retraining is unpleasant because of negative learning experiences during their formative years. Improving the appeal of adult vocational training programs may hinge in part upon creating the kind of learning environment which the potential participant perceives as oriented to his needs, employing those procedures that allow him to proceed at his own rate of learning with little fear of failure.

Research has demonstrated that teaching machines are as effective as live instructors in imparting knowledge.[16] The employment of programmed instruction has reduced in half the time required for many types of training. The real promise of this method of instruction, however, may be its ability to overcome the adult's reluctance to involve himself in the conventional classroom and to expose himself to possible ridicule in the eyes of his associates. The advantages of a programmed learning approach to adult training is that it recognizes individual differences in learning rate, it requires the active involvement of the learner, and it provides immediate feedback of results. The principle limitation of programmed instruction is its cost. Experience has shown that to program a full hour of instruction runs around $30,000. Off-the-shelf program materials may aid immeasurably in reducing such cost.

The Need for Further Research

Under the expanded program of federal support for vocational educational research and development, new opportunities are available for vocational educators at the local and state levels to become involved in R & D. By research, I have in mind those studies which offer to systematically test carefully stated hypotheses under controlled conditions. Developmental projects differ from research in that the results are already known. What is required is the testing out of the new practice or procedure in actual school situations. With such support in the offing for both areas of study, the urban vocational educator is in an excellent position to undertake innovative and experimental efforts to further his own or his institution's goals.

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[16] See, for example, Bushnell, David S. Technological Change and the Journeyman Electrician: An Experimental Study in Continuing Education, Vol. 1, SRI Project IM-4224, 1963. ED 017 671.

Some of the questions requiring further study are these:

1. What combinations of manipulative and cognitive skills are necessary to prepare a person for today's jobs and the demands of a complex community life? Can we combine vocational and general education through the use of technology (or other precedures) in such a way that both the academically oriented student will profit?

2. What methods can be found to anticipate or intercept students who may drop-out of school so that they might be redirected to more meaningful or rewarding programs?

3. What means might best be made available to teachers and faculty members for them to test out alternative ways of teaching students of varying backgrounds and interests?

4. How can appropriate educational opportunities be made available to older adults at a time when they are most needed without undue economic sacrifices?

5. What alternative methods can be designed for adult education programs where adults want a different form of instruction or instructional approach?

These questions need answers. What we accomplish in education in the future depends upon our research efforts today. New knowledge about learning and new technologies in education can expand our capacity to learn. Emerson once wrote, "our chief want in life is someone who will make us do what we can." A systems approach to educational R & D may be that key strategy which will help us achieve a degree of excellence in learning in the next generation that we can now only dimly perceive.

LONG RANGE PLANNING
IN
VOCATIONAL-TECHNICAL EDUCATION

Prepared for:

INSTITUTE IX

METROPOLITAN AREA APPLICATION
OF
VOCATIONAL EDUCATION INNOVATIONS
RESULTING FROM
RESEARCH AND DEVELOPMENT PROGRAMS
Albuquerque, New Mexico

by

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METROPOLITAN AREA APPLICATION OF VOCATIONAL EDUCATION INNOVATIONS RESULTING FROM RESEARCH AND DEVELOPMENT PROGRAMS

The Purpose of this paper is to present ideas that may be helpful in the development of a Long Range Planning System for Vocational Education. The application of this technique (or probably more appropriately, these techniques) to education is evolving, and there will be many modifications and adjustments made before a format emerges that will be in general use. A number of the ideas presented are my personal conception of a Long Range Planning System and should be treated as such. These ideas are a synthesis of procedures used in corporate management, farm management, and the study of and application of Planning, Programming, and Budgeting techniques in Vocational-technical education.

Many of you, I am sure, have given considerable thought and attention to the relationship between the State Department of Education and local districts as this relationship currently exists and what the relationship is likely to be when a Long Range Planning System is operational. Consider this paper food for additional thought which I hope will result in an even closer working relationship between the local schools and the State Department of Education in planning and conducting a vocational education program so that optimum results will be obtained.

The following is an outline of the paper:

I. The Planning Process

II. Types of Planning

    A. Policy Planning
    B. Work Planning

III. Conditions Necessary for Effective Planning

    A. The Planning Climate
    B. The Need for Comparable Information

IV. [illegible]

IV. Some Implications of the Installation of Systematic Planning in Vocational Education

V. Summary

I. The Planning Process

By definition, the planning process involves the continuing review of objectives and planned accomplishments established for each program, the analysis of possible alternative objectives, and the analysis of possible alternative programs meeting those objectives.

The activities involved in the planning process can be grouped under two major classifications: analysis and decision making. In a Planning, Programming, and Budgeting System, the planning activities cannot be carried out idependently. They are a sub-system within the management function at the state level. The outline below lists in sequential order the process of planning for vocational-technical education.

A. Analysis

1. Analysis of labor market needs
2. Analysis of population to be served
3. Current program inventory

B. Decision Making

1. Establishing long range objectives
2. Determining alternative ways of achieving objectives
3. Determining resources needed for each alternative
4. Selection from among alternatives

Many would consider planning as a science, but in its present state of development in vocational education it is still very much of an art. Kjell Eide has stated:

> "However, it (planning) should be accepted as a separate profession with distinctive professional requirements and standards, emerging from all the aspects of the planning process, including its interplay with other administrative functions. Administrative practitioners on the one hand, and research workers on the other, have their traditional roles, involving the use of restricted and simplified thinking models. Planners cannot use submodels which often have a very

low degree of autonomy. Their professional skill relates to operations with extensive models, with many degrees of freedom and often inconclusive evidence as to the empirical values of the coefficients linking various factors together. For such operations, previous experience in research or in executive administration may be more misleading than helpful."[1]

"This planning-research issue is fundamental, I think. But one has to differentiate to some extent.

Research in the more academic sense, to simplify a little bit, has the disadvantage that there is a shying away from the large type of models a planner has to operate with. A serious researcher doesn't like to operate within a situation where there is a kind of multipurpose involved, because then he has to do something unscientific in terms of assuming values, value weights, and so on. So usually our experience, at least, is that in the academic world research workers tend to simplify their research models to fairly small models with such a low degree of autonomy that you can't generalize from them at all." [2]

"If you go over to applied research, although there is no clear distinction here, there is an obvious difference in terms of typical attitudes. I think you can define applied research in a way similar to the way I define planning, really manipulating and playing around with broader models. The only distinct difference I can see is that a planning unit has to stick to certain types of discipline. If we are told to sort out a problem in two days, we do it. If we get one year to do the work, we adapt to that condition. Of course, the product will be very different, but in neither case are we to define the time limit.

If you go to an applied research unit, they have to operate with certain standards that make them say: "Well, all right; we can take that job but we can't do it in less than two years." I think there is a main difference between planning and research in terms of the role of deadlines." [3]

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1. Eide Kjell, The Planning Process; Ministry of Education, Oslo, Norway.

2. Stanley Elam and Gordon I. Swanson, Educational Planning in the United States; Illinois: F. E. Peacock Publishers, Inc., 1969; pp. 91-94.

3. Ibid.

II. Types of Planning

Policy Planning. Vocational educators and school administrators in the context of this paper implement basic policy decisions; they do not make them. New objectives or broadened objectives result from policy changes. The vocational educator or administrator affected by policy changes may find himself at odds with the policy as it might change his position or even indicate a need to change organizational structure. Three major policies have been made by Congress concerning vocational education.

In 1916, the Smith Hughes Act created an organization structure of vocational-technical education that was based on the economic structure and the educational subject matter (Vocational Agriculture, Home Economics, Trade and Industrial, etc). During the years that followed, the George Barden Acts I, II, and III extended this same classification into other program areas. Vocational education programs based on this classification are:

01. Vocational Agriculture Education
04. Distributive Education
07. Health Occupations Education
09.01. Consumer and Homemaking Education
09.02 Occupational Home Economics Education
14. Office Education
16. Technical Education
17. Trade and Industrial Education

The classification above describes what vocational education is through the use of an administrative and curricular structure. Funds were allocated to the various sections of this structure.

The Vocational Education Act of 1963 identified the population groups that are served by vocational education programs. The Smith Hughes and George Barden Acts' curricular classification with some expansion were retained. The population groups were:

1. Secondary school students
2. Post-secondary school students

3. Adults who are employed
4. Students with special educational needs

With the addition of the classification of the 1963 Act, vocational education could identify what was taught and who was served.

The concepts underlying the Vocational Education Act of 1968 are the recognition of the rapid acceleration in the rate of change in technology, and the decision to make education universal. Specifically in vocational education, these concepts make necessary a classification which emphasizes ends rather than means. In order to describe the function of vocational education independent of curricular content or level, the following functional classification was developed:

1. Occupational Orientation
2. Exploration (Group Guidance)
3. Skill Development (Pre Post-Secondary)
4. Job Proficiency Training
5. Updating
6. Upgrading
7. Retraining

Vocational education is now asked to describe the need for each of these classifications in terms of manpower needs and job opportunities and the needs of the people. The extent to which local districts can meet these needs is to be determined by the district's ability to support vocational education and the cost of the programs.

The policy decision has been made by Congress. In many states the development of Planning, Programming and Budgeting Systems is also a major factor in policy planning. Also, the establishment of an independent State Advisory Council for Vocational Education, which in most cases reports directly to the Governor, has provided a mechanism to formalize policy planning. The ability of vocational educators to respond to changes in policy which could require the modification of development of new objectives may well determine the level of continued financial support.

In order to make the transition from past stated goals and objectives to the goals and objectives that are stated at the present time and to ones that may develop in the future, a formal method of assessing needs, current activities, and results related to those needs had to be developed.

Work Planning. Work planning in vocational education under Public Law 90-576 must be based on the concept of real time. We must raise the question of relevance. Within the activities being conducted, there are those that are not contributing and can be replaced as well as those where the level of performance is not adequate to deliver needed services, and there are programs that need modification.

SYSTEMS AND REAL TIME

An underlying concept in these reports is that of real time. To function in real time may be regarded in one of the following two ways.

1. Automation

   In this type of real time system, "live" information controls on-going process or events. Such systems can involve people for special pruposes and are essentially non-adaptive. The Apollo space flights are good examples of this type of a real time system.

2. Cybernetics

   In these discussions, cybernetic systems will involve massive and intimate human participation. The system itself can exhibit a sense of survival and, in its response to information, can change its structure in appropriately adaptive ways. Civilization and its history of both evolutionary and revolutionary adaptiveness is an example of such a cybernetic system.

The present educational system is non real time. The following quote is germane.

> "In the language of the information sciences, (--cybernetics, computer sicence, data processing, systems analysis, information storage and retieval, etc.) education currently occurs in a non-real time mode but it may increasingly have both a need and a capability for operating in real time... - changes in society, in the economy, and in science and technology -- imply a reduction in the amount of time for institutional adaptation. Education, from the point of view of its timeliness, can operate effectively in isolation from other institutions when change is relatively slow; it cannot be equally effective in isolation when change is relatively rapid, as is now the case. Hence we are led inexorably to the idea that within the next twenty years learning environments

> ought to be designed more like real-time information processing systems. (Toward Education in Real Time, Perry E . Rosove, System Development Coporation, August 7, 1969).
>
> it will develop that the educational system must go real time in the cybernetic sense. This suggests and correctly so, that an enormous gap exists between the educational system as it is now structured and what it fairly soon must become. Time is not on its side."[4]

Educators generally are taking the first steps. We in vocational education are attempting to shift gears in order to shorten the time span between the identification of needs and their adoption, be it adding new curricula, updating or eliminating others, or allocating resources in different ways.

In order for vocational education planning and programming to go real time we must develop the means by which program activity is responsive to policy. The following, taken from a report to the State Advisory Council for Vocational Education, is an attempt to show the planning and programming activity in Minnesota currently:

> The long Range Plan and Annual Plan for Vocational-Technical Education have a number of functions. Some of these are mandates from the Vocational Education Act of 1968; all will assist inthe improvement and development of vocational-technical education programs in Minnesota.

GOAL I - TO ORGANIZE VOCATIONAL EDUCATION INTO A SINGLE PLANNING, OPERATING, AND REPORTING SYSTEM

The requirement for planning is a mandate of the Vocational Education Act of 1968. In Minnesota education decision making is concentrated at the local school district. The State Plan, therefore, will represent a composite of locally established needs and services.

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[4] Walter James, Pupil Subsystem Report #2; Minnesota Department of Education, 1969; p. 3-4.

OBJECTIVE I. LONG RANGE PLANNING

For the 1970-74 Plan	For the 1971-75 Plan
The time available between the receipt of the federal Plan requirements and the deadlines for Plan submission precluded State Plan preparation based on local information.	A Local Long Range Plan was designed and local educational agencies were given assistance in completing it. When the Local Long Range Plans are summarized, data will be available describing the need for job proficiency training and pre post-secondary programs. The indicators of need for exploration and occupational orientation are generally not available in current student follow-up studies because they have never before been asked for in this form. Because of school size and staff availability some districts have been able to collect and summarize data describing these needs.

OBJECTIVE 2: ANNUAL PLANNING

For the 1970-74 Plan	For the 1971-75 Plan
In Tables II, III, IV (Part III) and special sections, regular programs were described by occupational objectives and level. Special programs and services for the disadvantaged and handicapped were not identified. The lateness of the Federal Appropriation in relation to school budgeting and programming caused additional problems.	In Tables II, III, IV (Part III) and special sections, a Local Annual Plan is designed and local educational agencies are receiving assistance in completing it.

At this time the Local Annual Plans are being received. When summaries are available, they will show requests for support for vocational-technical programs on a district, regional, and state basis and will describe these program requests in terms of objectives, level, and program purpose.

OBJECTIVE 3: REPORTING THE RESULTS OF ACTIVITIES

For the 1970-74 Plan	For the 1971-75 Plan
Activities concentrated on the design and instruction of local educational agencies in utilization of a reporting system based on programs, objectives, and purposes identified.	Reports of programs, activities, and services will use the same documents as the Annual Plan. This will make it possible to compare programs offered with plans and needs.

When a summary of the program activities is available for Fiscal Year 1971, it will:

1. Show changes in emphasis of program activity on a district, regional, and state basis.
2. Show program activity by level, objectives, and program purpose.
3. Describe program costs for accomplishing specific objectives on a total and a cost per student hour basis.

GOAL 2 - TO PROVIDE FOR COORDINATED EQUILIZATION OF VOCATIONAL PROGRAM OPPORTUNITIES FOR PERSONS OF ALL AGES IN ALL GEOGRAPHIC AREAS OF THE STATE

OBJECTIVE 1: TO DEVELOP COOPERATIVE VOCATIONAL CENTERS IN OUTSTATE MINNESOTA

For the 1970-74 Plan	For the 1971-75 Plan
Operate two experimental centers in 1970, and expand to 25 by 1974. Accomplishments: In addition to the experiemental centers planned, two additional centers began operation in 1970.	Operate nine centers in 1971, and expand to between 70 and 80 by 1975.

OBJECTIVE 2: TO EXPAND VOCATIONAL EDUCATION IN THE SEVEN-COUNTY METROPOLITAN AREA

For the 1970-74 Plan	For the 1971-75 Plan
By Fiscal Year 1974 to have in operation three additional intermediate vocational education districts to serve the geographic area. Hennepin County and Ramsey-Washington County are organized. Dakota County is in the process.	Continue the development.

GOAL 3 - TO PROVIDE FOR THE VOCATIONAL EDUCATION NEEDS OF DISADVANTAGED PERSONS IN REGULAR PROGRAMS OR TO DEVISE SPECIAL PROGRAMS OR SERVICES FOR THEM

OBJECTIVE 1: IDENTIFICATION

For the 1970-74 Plan	For the 1971-75 Plan
Part I, Section 3.12 Part II, Section 3.1 (5)	No Change.
Low income. Children 5 to 17 in families with incomes below $2,000 and $2,000.	No change.
Students below grade level. No information	Summary of local Long Range Plan will show students over 14 below the 9th grade.
Unemployment and underemployment	
Universe of need. Work force estimates.	Same plus estimate of underskilled in labor force.
Dropouts. Used available statistics showing relationships of 5th grade to 12th grade enrollment	Report in changes of school memberships will be used. School form is shown; a partial summary by regions will be included in the 1971 Plan.
Members of racial minorities. Three charts showing minority population projections to 1974.	Charts combined to minority population to each other and to states' total population.
Persons supported by Public Welfare, 1968 AFDC Cases and children	No change.

Note: Your attention is called to the changes in the method of identifying handicapped persons in need of vocational education programs or services. During Fiscal Year 1971, a similar method will be developed for disadvantaged persons needing vocational education programs or services.

OBJECTIVE 2: PROGRAMS AND SERVICES FOR DISADVANTAGED PERSONS

For the 1970-74 Plan	For the 1971-75 Plan
Programs and services supported with Part B set aside and special funds for the disadvantaged were made up of some programs that were previously supported with special funds. Additional programs were supported on individual project application basis.	In addition to the support of continuing programs, an analysis of requests for expanded and new programs or services for disadvantaged persons will be made. The Annual Plan will be used as the basis for this analysis.

GOAL 4 - TO PROVIDE FOR THE VOCATIONAL EDUCATION NEEDS OF HANDICAPPED PERSONS IN REGULAR PROGRAMS OR TO DEVISE SPECIAL PROGRAMS OR SERVICES FOR THEM

OBJECTIVE 1: IDENTIFICATION

For the 1970-74 Plan	For the 1971-75 Plan
Part I, Section 3.13 Part II, Section 3 Mentally retarded. Incidence figures of disability. Hard of hearing. Incidence figures of disability. Speech imparied. Incidence figures of disability Visually handicapped. Incidence of disability. Seriously emotionally disturbed. Incidence of disability. Physically impaired. Incidence of disability.	The use of the word "children" replaced with "persons". "Felons" included 5 (c). Incidence of disability will be replaced by description of a number of objectives that are appropriate to specific handicapped persons. For Fiscal Year 1971, a major effort will be made to collect data that will identify the needs for these objectives.

Note: A number of agencies are currently serving handicapped persons.

Diagrams are attached which slow the inter-relationships and areas of common interest of Special Education, Vocational Education, and Rehabilitation Agencies.

OBJECTIVE 2: PROGRAMS AND SERVICES FOR HANDICAPPED PERSONS

For the 1970-74 Plan	For the 1971-75 Plan
Programs and services supported with Part B set aside and special funds for the handicapped were made up of some programs that were previously supported with special need funds. Additional programs were supported on an individual project application basis.	In addition to the support of continuing programs, an analysis of requests for expanded and new programs or services for handicapped persons will be made. The Annual Plan will be used as the basis for this analysis.

GOAL 5 - TO PROVIDE PRE-SERVICE AND IN-SERVICE EDUCATION FOR VOCATIONAL EDUCATION TEACHERS TO MEET THE NEEDS IDENTIFIED IN THE VOCATIONAL EDUCATION ACT AND THE STATE PLAN

OBJECTIVE: LONG RANGE PLANNING

For the 1970-74 Plan	For the 1971-75 Plan
Part Two, Section 6.0, TAble 6, shows the number of teachers employed in vocational education programs by occupational area for 1970 and estimated for 1974.	The analysis of the Local Annual Plans will identify teacher assignment by objective, level, and program purpose.
Table 7 shows teacher training enrollment in relation to the current objectives and special sections of the Vocational Education Act of 1968.	A technical assistance grant has been received for the development of a Comprehensive Plan for Teacher Education during Fiscal Year 1971.

GOAL 6 - TO DEVELOP SYSTEMATIC METHOD FOR FINDING, DESIGNING, TESTING, AND INSTALLING MORE EFFICIENT AND EFFECTIVE WAYS OF PROVIDING VOCATIONAL PROGRAMS AND SERVICES TO PEOPLE

OBJECTIVE 1: FINDING (PART C, RESEARCH AND TRAINING)

For the 1970-74 Plan	For the 1971-75 Plan
Support of the Research Coordinating Unit at the University of Minnesota.	Support of the Research Coordinating Unit at the University of Minnesota.

OBJECTIVE 2: DESIGNING

For the 1970-74 Plan	For the 1971-75 Plan
Two cooperative vocational centers outstate.	Support for new activities to be based on evidence produced in planning projects.
Career development project, Twin City Metropolitan Area.	
Cooperative Program operation, secondary schools and an area vocational-technical school.	
A number of small planning grants to local educational agencies.	

OBJECTIVE 4: INSTALLING

For the 1970-74 Plan	For the 1971-75 Plan
Based on information of success and interest, additional cooperative vocational centers are being made operational.	Continue the same installation process with other innovative programs or services.

The material above outlines the framework for vocational education planning in Minnesota. Obviously not shown is the massive changes in local and state activity that will be required over the next few years, in order to install the new process of work planning.

III. Conditions Necessary for Effective Planning

The Climate. With the passage of Public Law 90-576, Congress removed all reference to subject matter categories and in their place installed the requirement of local and state planning on an annual and projected basis. As stated before, this requirement for planning recognizes the rapid acceleration in the rate of change in technology and the commitment to make education universal. This Act then mandates the change in role of the State Department of Education from that of technical assistance and distribution of dedicated funds to one of recommending allocations of resources based on the interpretation of economic and demographic data.

One caution must be voiced when we consider long range projections. First, projections are not predictions of the future. Any projection of a demographic or economic variable must be based on past events or trends. A simple method is a "straight line" projection. Mathematical functions -- simple or involved -- are more complex and can be applied to historical data and utilized to obtain future estimates. In a few instances the effect of known or planned changes in policies or in related variables can be brought to bear on the problems. More often, the estimator will consider judgments about probable future change, based on specialized knowledge in his discipline and more general knowledge about many specific changes which will have an impact on the statistical under analysis and projection.

Second, one of the real purposes of projection of data, such as population, is to be wrong, when the projection date is reached. Wrong, that is, in the sense that the implications of the projection, when made, set in motion research, analysis, and resultant changes in policy that will pruposely alter the factors originally assumed.

The entire operation must be the personal responsiblity of the executive head of the organization. In the case of vocational-technical education, no one at a lower level has the authority or the right to acquire the knowledge required to perform the necessary tasks of coordination. As head of the Program Planning and Development Section within the Division of Vocational-Technical Education, I have no authority except through Mr. Van Tries, our Assistant Commissioner. It is my feeling that my staff and I perform the functions of technical assistance to management. We are not decision makers, even though at times we are accused of making decisions when our analysis of a situation recommends one alternative.

The Need for Comparable Information. Programming is the process of combining into program categories the activities of various organizational units which have the same functional objectives. This process of programming required the construction of a program structure described on page 4. What is the purpose or function of the program structure? As I see it, it provides a means of displaying the problem areas of any program. In other words, a program structure is the result of top management decisions rather than a means of arriving at such decisions. Its development is the result of negotiations, discussion, study, and intuitive judgment of the executive staff. This means it is more than the mere cutting up of the line-item budget into different pieces. It need not follow either staff or school organizational patterns.

True, the capability to construct an object of expenditure budget must be built into the accounting structure (because that's how the money is spent). But the program structure for any budget cycle must display the functions of vocational education with particular emphasis on the most pressing problems. Therefore, it must not be thought of as "carved in stone." As needs change, a third level activity could be raised to the level of a sub-program and major program area might be reduced to an element.

A copy of the Local Long Range Plan form and Handbook for its preparation as well as a copy of the Local Annual Program Plan and directions for its completion are included with this paper as a reference. It should be noted that the Annual Plan provides the mechanism to attach costs to functions and objectives, and also to relate vocational education costs and returns to other educational programs.

Management analysis is an analysis of the function of educational management. Here is the point where the State Educational Agency in its totality must carefully review laws, rules, regulations, and procedures that affect the ability of a local school to choose from among alternative means of achieving vocational-technical education objectives. Inasmuch as the responsiblility for the educational process under the Planning, Programming and Budgeting System will rest with the local district, the decisions concerned with these processes must be under their control.

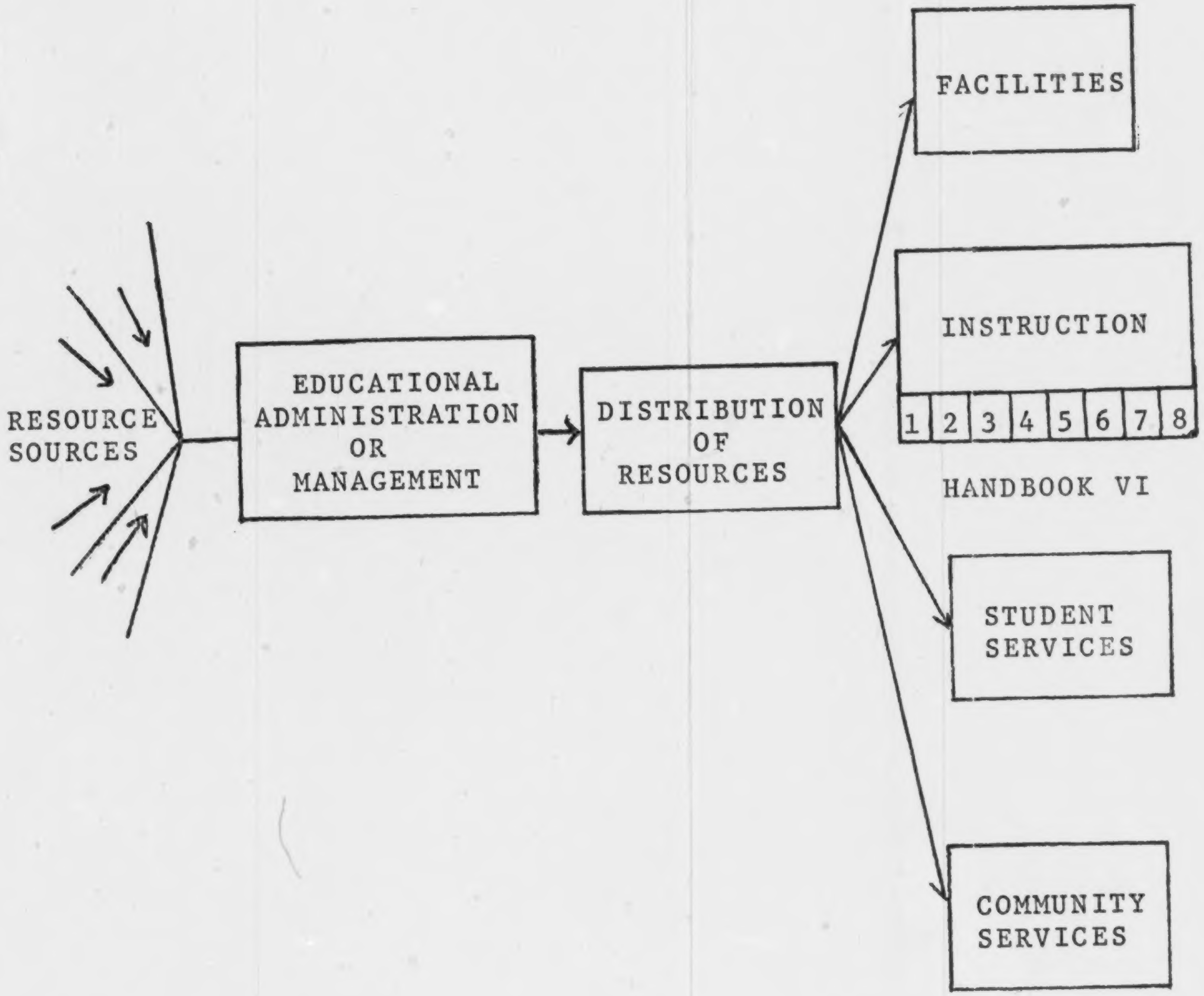
Table I shows that various sources of support for education at either the state or local level are available, and they seem to be increasing. Local educational management has the responsibility for allocating them among the various programs. Indicated are the uniform accounting codes and a reference to Handbook VI.

Table II is a mirror image of the management resource flow chart. These resources are not only money, therefore, management analysis system for education must contain both statistical and financial data elements. These data must be so aggregated that they reflect the degree of progress made toward obtaining an objective. If we are to analyze the efficiency and effectiveness of educational management, we must be able to separate out the costs and functions and results separately from the other functions of the educational system. As illustrated here, the analysis instruments must be so constructed that they will provide for analysis of each of the areas shown. Let us look at the Instruction Section.

As an illustration of the analysis of utilization of resources, a form such as the Instructional Program Analysis, Table III, could be used for any vocational instructional program. We might have to modify some of the inputs, and certainly we would have to vary the output measures; but the format could be used for any program. This type of analysis gives the person responsible for the instructional program a view of the performance of the program as well as a comparison with the average of all similar programs in the state. It also provides information to him as to the location of his program in the range as demonstrated between relationship of the program to the 20 percent high or the 20 percent low.

TABLE I

EDUCATION RESOURCE MANAGEMENT FLOW CHART


RESOURCE SOURCES
EDUCATIONAL ADMINISTRATION OR MANAGEMENT
DISTRIBUTION OF RESOURCES
FACILITIES
INSTRUCTION
1 2 3 4 5 6 7 8
HANDBOOK VI
STUDENT SERVICES
COMMUNITY SERVICES

ACCOUNT SERIES	
(300)	Maintenance & Operation Acquisition or Improvement
(250)	Instructional Administration of Supervision (Technical Assistance)
(___)	Instructional Equipment
(100)	Instructional Personnel
(400)	Food Services
(500)	Personnel Services Health Services Etc.
(600)	Transportation
(700)	Community Services, Gen. Recreation Civic Activity Public Offices Custody and Detention Etc.

TABLE II

ANALYSIS OF VOCATIONAL-TECHNICAL EDUCATION MANAGEMENT

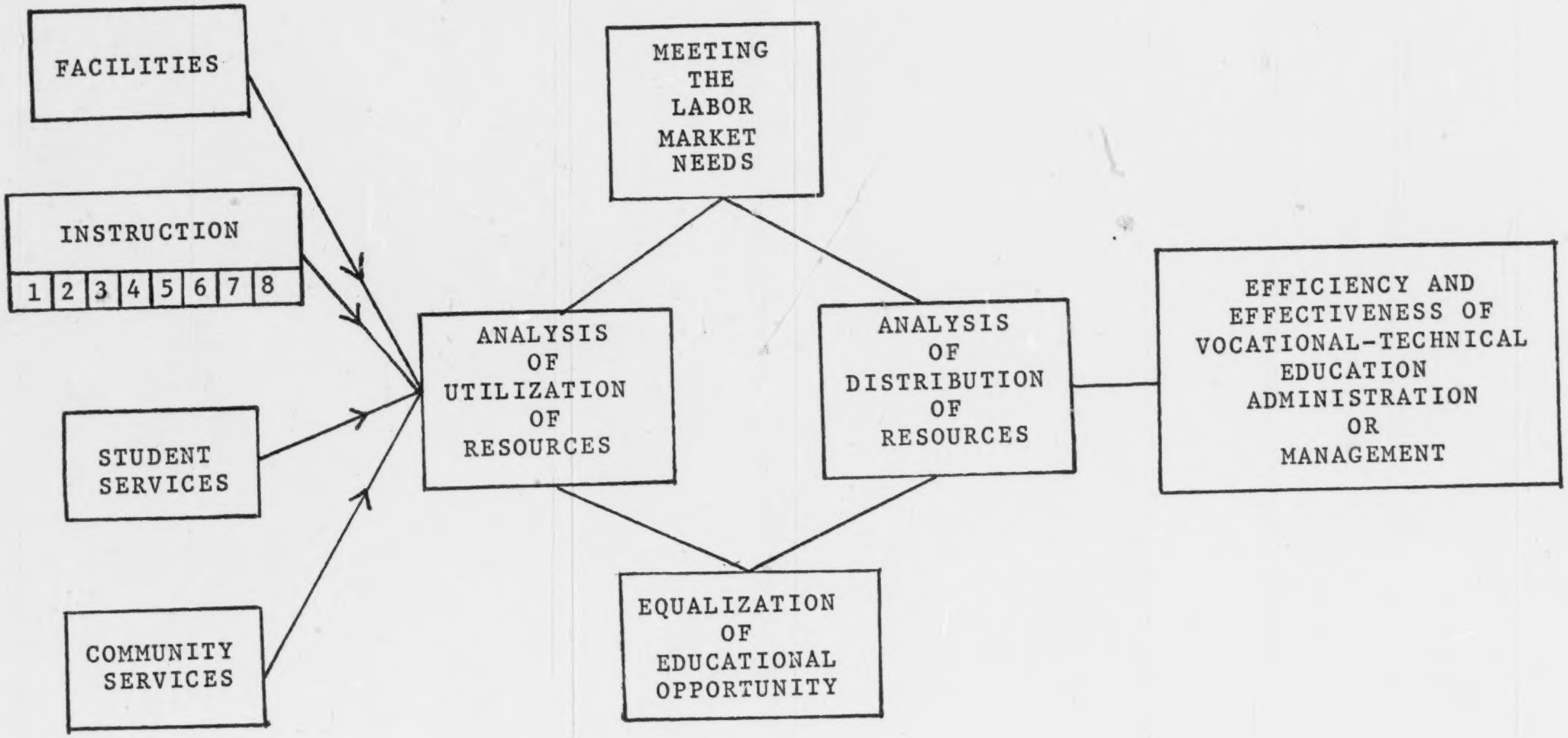

FACILITIES
INSTRUCTION
1
2
3
4
5
6
7
8
STUDENT SERVICES
COMMUNITY SERVICES
MEETING THE LABOR MARKET NEEDS
ANALYSIS OF UTILIZATION OF RESOURCES
ANALYSIS OF DISTRIBUTION OF RESOURCES
EQUALIZATION OF EDUCATIONAL OPPORTUNITY
EFFICIENCY AND EFFECTIVENESS OF VOCATIONAL-TECHNICAL EDUCATION ADMINISTRATION OR MANAGEMENT

TABLE III

INSTRUCTIONAL PROGRAM ANALYSIS

PROGRAM N YEAR 197_

NPUTS (COSTS)	THIS PROGRAM	AVERAGE OF ALL PROGRAMS	20% HIGH	20% LOW
nstruction				
dministrative & Supervisory				
quipment				
upplies				
eaching				
urriculum Development				
ost per student				
ength of Program				
umber of Students Entering				
ther Student Characteristics				
ther Inputs				
ther Inputs				
UTPUTS (RETURNS)				
umber of Graduates				
umber of Graduates Working				
ther Outputs				
ther Outputs				
umber of Months				
pprenticeship Credit for Training				
atisfaction Index				
ther Outputs				

An advantage of such an analysis is that after looking at the output measures, the persons responsible for the program will look for the critical input variables, or to say it in another way, he will look for that input which if modified will result in the greatest progress toward increasing the efficiency and effectiveness of the program.

In order to develop such a management document as described above, it is essential that a common statistical and financial data base be used.

IV. Some Implications of the Installation of Systematic Planning in Vocational Education

It is beyond our capability today to attempt to find answers to the myriad of problems that, if not currently apparent, will arise with the installation of systematic planning in vocational education. Some of the hurdles that must be overcome are as follows:

1. To change the emphasis from the process of education to the results in relation to need.
2. The construction of a common data base that will assist vocational-technical educators in setting objectives.
3. The separation of the management functions from instruction and student service functions.
4. The development of a unified accounting system (probably mechanized) that will have the responsiveness to assist educational managers in their decision making.
5. The design of a management analysis document that will measure the efficiency and effectiveness of educational management.

V. Summary

This paper is an attempt to view the role of planning as a manager's tool in improving the performance of vocational-technical education. No effort was made to develop a model comprehensive long range planning guide at the state or local level. Rather, the intent has been to share with you some of the concepts and techniques we are developing in Minnesota.

The Vocational Education Act of 1968 mandates that we take a new look at vocational-technical education. We are forced to ask new questions and to see answers to old questions in new ways.

The purpose of this institute is to look at innovative means of meeting the vocational education needs of urban people. One innovation badly needed from my view is the need for management by objective rather than process management.

MEMORANDUM

April 9, 1970

TO: Superintendents of Schools

FROM: J. F. Malinski, Director
Program Planning & Development
Vocational-Technical Education

RE: Local Annual Plan for Vocational-Technical Education

Enclosed you will find a copy of the Annual Plan for Vocational-Technical Education for Fiscal Year 1971. We recommend the following procedure in preparing the Plan:

1. On the cover page check each of the program objectives and levels that apply.
2. Please note Page 3, where we ask for a narrative description of (a) joint programming and planning, (b) developmental programs being planned, and (c) changes in occupational program offerings.
3. The two forms that include all the necessary information for instructional programs are titled VOCATIONAL-TECHNICAL EDUCATION PROGRAM AND FINANCIAL DETAIL (DEVELOPMENTAL AND OCCUPATIONAL PROGRAMS).
4. Area vocational-technical schools, junior colleges, and other schools where non-instructional personnel have been reimbursed use the page titled VOCATIONAL-TECHNICAL EDUCATION PROGRAM AND FINANCIAL DETAIL (SUPPORT SERVICES) (optional) for this part of the program.
5. The pages titles VOCATIONAL-TECHNICAL EDUCATION ANNUAL PLAN SUMMARY -- SECONDARY, POST-SECONDARY, AND ADULT are included to show you the analyses that can be developed from the basic information shown on the Program and Financial Detail page and the Local Long Range Plan for Vocational-Technical Education.
6. The final three pages show the DISTRICT FINANCIAL AND PROGRAM SUMMARY. We would appreciate it if you would complete this analysis for this year.

Robert P. Van Tries, Assistant Commissioner, Division of Vocational-Technical Education, has asked that this analysis be developed for his use and that of the State Board ofr Vocational Education. If each district or institution offering vocational education programs assists us to the extent of completing its individual analysis, we will be able to provide a statewide summary at an earlier date.

Discussions within the Division of Vocational-Technical Education regarding the relationship of the Local Annual Plan for Vocational-Technical Education and the current practice of submitting agreements for reimbursement have lead us to the decision that for the school year 1970-71, both the Annual Plan and the Agreements will be required. This is necessary in order that a smooth transition can be made to the use of only the Annual Plan.

In developing The Annual Plan and the preparation of the Agreements, be sure dollar totals of all agreements equal the dollar total on the Annual Plan. It will require a notation on the Annual Plan in some cases explaining any differences.

If you have any questions concerning the development of the Annual Plan, please call me or the Planning Coordinator for your region at (612) 221-2421.

Enclosed are directions for completion of the Program and Financial Detail pages.

Enclosure

cc: Area Vocational-Technical School Directors
Local Program Directors

DIRECTIONS FOR COMPLETION OF ANNUAL PROGRAM PLAN FOR VOCATIONAL-TECHNICAL EDUCATION PROGRAM AND FINANCIAL DETAIL (DEVELOPMENTAL AND OCCUPATIONAL PROGRAMS)

1. A separate page should be prepared for each program objective. For Example:

Program Level

Secondary ☒
Post-Secondary ○
Adult ○
  Updating ○
  Upgrading ○
  Retraining ○
  Apprenticeship ○

Occupational Objective

○ 01 Agriculture
☒ 04 Distributive
○ 07 Health
○ 09.01 Consumer & Homemaking
○ 09.02 Wage Earning Home Economics
○ 14 Office
○ 16 Technical
○ 17 Trade & Industrial

Program Purpose

Regular ☒
99.06 Handicapped ○
99.07 Disadvantaged ○
○ Cooperative B
○ Cooperative G

2. Show the portion of the program that is continuing or expanded. Show programs offered for the first time in your school as a new program as follows:

   a. Teacher Information - Name as it appears on the teaching certificate. The File number is the six-digit file folder number on the upper right corner of the certificate. The Subject Code is a four-digit number (it may not appear on older vocational certificates). Expiration Date indicates the year in which the present certificate will expire. Teacher Assignment-Full time assignment to this vocational objective. Part time assignment is that portion of the assignment related to this objective (For purposes of the Annual Plan, full time assignment will be six periods per day including preparation time, so all part time assignments should be in terms of sixths).

   b. Students - total number of students for the objective described. Do not relate students to teachers. The Program Hours are the hours of teacher assignment times the number of days in session.

Total student hours are the total students times program hours. The estimated number of program completions for programs extending over one year is the number of students expected to complete this objective during the current year.

3. Financial Summary for this Objective - The items to be included for for this objective are as follows:

   a. Salaries, travel, and supplies - 200 series in the Uniform Financial Accounting Handbook

   b. Equipment - replacement and maintenance for continuing programs from 700 series, equipment rental from the 200 series, equipment purchases for expanded or new programs from the 1200 series.

   c. Other instructional costs - 200 series, including library and audio visual materials, field trips, graduation costs, and contracted services.

NOTE: Not all program costs that will be identified here are reimbursable under the current agreement system.

LOCAL ANNUAL PLAN FOR VOCATIONAL-TECHNICAL EDUCATION

FISCAL YEAR 19__

Name of School ______________________________

District Code Number ______________________________

County Code Number ______________________________

OCCUPATIONAL PROGRAMS (Check all that apply)	SECONDARY	POST-SECONDARY	ADULT	MULTI-LEVEL
Agriculture				
Distributive Education				
Health				
Consumer & Homemaking				
Wage Earning Home Ec.				
Business & Office				
Technical				
Trade & Industrial				
DEVELOPMENTAL PROGRAMS				
Occupational Orientation				
Exploration				
Pre Post-Secondary				
Remedial				
Related Instruction				

OTHER (e.g. Exemplary, ______________________________
Handicapped, ______________________________
Disadvantaged, ______________________________
Elementary) ______________________________

The above named local board of education hereby applies to the State Board for Vocational Education to conduct vocational education programs as listed herein.

We agree that all class work, selection of teachers, records, and reports will be in accordance with the Minnesota State Plan for Vocational-Technical Education and that all instructional supplies, equipment, buildings and materials furnished by us will be such as approved by the State Board for Vocational Education.

We hereby assure the State Board of Vocational Education that:

1. All programs, services, and activities covered by this application will be operated in accordance with the Minnesota State Administrative Plan for Vocational-Technical Education.

2. The expenditure of local funds to support programs, services, and activities covered by this application will be maintained or extended. Any federal or state funds made available will be used to supplement additional local funds.

3. Reimbursements received will not be used for any programs of vocational education (except consumer and homemaking education) which cannot be demonstrated to (a) prepare students for employment or (b) be necessary to prepare individuals for successful completion of such a program or (c) be of significant assistance to individuals enrolled in making an informed and meaningful occupational choice.

4. It is understood that the reimbursement will be discontinued when the program becomes disqualified for any failure to meet the requirements of the Minnesota State Plan for Vocational-Technical Education and the unexpended balance of the reimbursement contracted for will be forfeited.

5. All programs and services have been developed in consultation with representatives of the educational and training resources available to the area to be served.

6. These programs include adequate planning to meet the vocational education needs of potential students in the area or community served.

7. These programs include a plan, related to the appropriate comprehensive area manpower plan (if any), for meeting the vocational education needs in the area or community served.

8. This plan indicates how, and to what extent the vocational education programs, services, and activities proposed in the application will meet the needs set forth.

9. The applicant will make an annual report evaluating accomplishments, and such other reports as may be required by the State.

Signed: ______________________________ and/or
Local Director

____
Superintendent

Approved: ______________________________
Assistant Commissioner,
Division of Vocational-
Technical Education

Include any of the following that are appropriate. (Use additional sheets as necessary).

1. Narrative describing cooperative activities with (1) other school programs such as ESEA I-III, Special Education, Vocational Rehabilitation, (2) other community programs such as Model Cities, Concentrated Employment Program, Neighborhood Youth Corps, community action agencies, etc., (3) private industry and special arrangements for instructors, equipment, loans, student recruitment, etc.

2. Narrative describing the reasons developmental programs are being planned and conducted. Refer to that section of the Local Long Range Plan which indicates the need for these programs.

3. Narrative describing changes in occupational program offerings, additions, expansions or deletions. Refer to that section of the Local Long Range Plan which serves as a basis for the decision.

These should be concise statements, and should emphasize student aspirations and performance (based on follow-up), and the employment needs of the area.

TATE OF MINNESOTA
epartment of Education
ocational-Technical
Education Division

VOCATIONAL-TECHNICAL EDUCATION
(Program and Financial Detail)

(Developmental Programs)

chool Name ____________________
ounty Code Number ____________________
istrict Code Number ____________________

Program Level
Elementary ☐
Secondary (7-12) ☐
Post-Secondary ☐
Adult
Retraining ☐
Apprenticeship ☐
Multi-level ☐

Program Objective
☐ 99.02.01 Occupational Orientation
☐ 99.02.02 Exploration
☐ 99.03 Pre Post-Secondary
☐ 99.04 Remedial
☐ 99.10 Related Instruction

Program Purpose
☐ 99.01 Exemplary
☐ Regular
☐ 99.06 Handicapped
☐ 99.07 Disadvantaged

Course Name and Objective	Teacher Information						Students		Program Hours	Total Student Hours	Estimated Number of Program Completions
	Name	Voc. Certification			Assignment						
		File No.	Subj. Code	Exp. Date	FT	PT	M	F			
(Continuing)											
(Expanded)											
(New)											
TOTALS											

INANCIAL SUMMARY FOR THIS OBJECTIVE

	Salaries	Equipment	Supplies	Teacher Travel	Other	TOTAL
Continuing Program						
Expanded Program						
New Program						

FOR STATE USE ONLY

Recommended for Approval (Unit) ____________________

Signed ____________________

County-District Code	Level Code	Program Objective	Program Purpose	Eligible Amount	Reimbursement Rate

STATE OF MINNESOTA
Department of Education
Vocational-Technical
Education Division

VOCATIONAL-TECHNICAL EDUCATION
(Program and Financial Detail)

(Occupational Programs)

School Name ______________________

County Code Number ________________

District Code Number _______________

Program Level	Occupational Objective	
Secondary (9-12)	01	Agriculture
Post-Secondary	04	Distributive
Adult	07	Health
Updating	09.01	Consumer & Homemaking
Retraining	09.02	Wage Earning Home Economics
Upgrading	14	Office
Apprenticeship	16	Technical
	17	Trade & Industrial

Program Purpose

	Regular	Cooperative B
99.06	Handicapped	Cooperative G
99.07	Disadvantaged	

Course Name and Objective	Teacher Information						Students		Program Hours	Total Student Hours	Estimated Number of Program Completions
	Name	Voc. Certification			Assignment						
		File No.	Subj. Code	Exp. Date	FT	PT	M	F			
(Continuing)											
(Expanded)											
(New)											
				TOTALS							

FINANCIAL SUMMARY FOR THIS OBJECTIVE

	Salaries	Equipment	Supplies	Teacher Travel	Other	TOTAL
Continuing Program						
Expanded Program						
New Program						

FOR STATE USE ONLY

Recommended for Approval (Unit) ______________________

Signed ______________________

County-District Code	Level Code	Program Objective	Program Purpose	Eligible Amount	Reimbursement Rate

ANNUAL PROGRAM PLAN (F-52-7A)

PAGE ___ OF ___ PAGES

VOCATIONAL-TECHNICAL EDUCATION
(Program and Financial Detail)

(Supplementary Sheet)

Course Name and Objective	Teacher Information						Students		Program Hours	Total Student Hours	Estimated Number of Program Completions
	Name	Voc. Certification			Assignment						
		File No.	Subj. Code	Exp. Date	FT	PT	M	F			

ANNUAL PROGRAM PLAN (F-52-7A)

PAGE __ OF ___ PAGES

STATE OF MINNESOTA
Department of Education
Vocational-Technical
Education Division

VOCATIONAL-TECHNICAL EDUCATION
(Program and Financial Detail)

(Support Services)

School Name ____________________

County Code Number ____________________

District Code Number ____________________

Program Level

Secondary (9-12)
Post-Secondary
Adult (All Levels)

Program Purpose

	Regular	Cooperative B
99.06	Handicapped	Cooperative G
99.07	Disadvantaged	Exemplary

Position	Number of Staff		Number of Students		Program Costs				Program Activities Related to Long Range Objectives	
	FT	PT	M	F	Salaries	Staff Time	Equipment	Indirect	Target	% Being Met
TOTALS										

FOR STATE USE ONLY

Recommended for
Approval (Unit) ____________________

Signed ____________________

County-District Code	Level Code	Program Objective	Program Purpose	Eligible Amount	Reimbursement Rate

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ANNUAL PROGRAM PLAN (F-52-7A)

STATE OF MINNESOTA
Department of Education
Vocational-Technical
Education Division

VOCATIONAL-TECHNICAL EDUCATION
Annual Plan Summary

(Secondary)

School Name ____________________

County Code Number ______________

District Code Number ____________

Program Objective	Number of Teachers		Number of Students		Number of Program Hours	Total Student Hours	Program Costs			Program Activities Related to Long Range Objectives	
Group Guidance Occupational Orientation	FT	PT	M	F			Instruction	Equipment	Indirect	Target	% Being Met
Continuing Program Expanded Program New Program											
Sub Total											
Exploration Continuing Program Expanded Program New Program											
Sub Total											
TOTAL (Group Guidance)											
Pre Post-Secondary Skill Development Continuing Program Expanded Program New Program											
TOTAL (Pre Post-Secondary)											

ANNUAL PROGRAM PLAN (F-52-7A)

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STATE OF MINNESOTA
Department of Education
Vocational-Technical
Education Division

VOCATIONAL-TECHNICAL EDUCATION
Annual Plan Summary

(Secondary)
(Continued)

School Name ____________________

County Code Number ______________

District Code Number _____________

Program Objective	Number of Teachers		Number of Students		Number of Program Hours	Total Student Hours	Program Costs			Program Activities Related to Long Range Objectives	
Job Proficiency Training	FT	PT	M	F			Instruction	Equipment	Indirect	Target	% Being Met
Continuing Program Expanded Program New Program											
TOTAL (Job Proficiency Trng.)											
TOTAL (Secondary)											
Consumer & Homemaking Continuing Program Expanded Program New Program											
TOTAL (Consumer & Homemaking)											
TOTALS											

Reviewed By ____________________

Signed ____________________

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ANNUAL PROGRAM PLAN (F-52-7A)

STATE OF MINNESOTA
Department of Education
Vocational-Technical
Education Division

VOCATIONAL-TECHNICAL EDUCATION
Annual Plan Summary

(Post-Secondary)
(Instructional Programs)

School Name ____________________

County Code Number ____________________

District Code Number ____________________

Occupational Objective (By 2-digit O.E. Code)	Number of Teachers		Number of Students		Number of Program Hours	Total Student Hours	Program Costs			Program Activities Related to Long Range Objectives	
	FT	PT	M	F			Instruction	Equipment	Indirect	Target	% Being Met
TOTALS											

Reviewed by ____________________

Signed ____________________

ANNUAL PROGRAM PLAN (F-52-7A)

STATE OF MINNESOTA
Department of Education
Vocational-Technical
Education Division

VOCATIONAL-TECHNICAL EDUCATION
Annual Plan Summary

(Adult)
(Instructional Programs)

School Name ______________________

County Code Number ______________

District Code Number _____________

Occupational Objective (By 2-digit O.E. Code)	Number of Teachers		Number of Students		Number of Program Hours	Total Student Hours	Program Costs			Program Activities Related to Long Range Objectives	
	FT	PT	M	F			Instruction	Equipment	Indirect	Target	% Being Met
TOTALS											

Reviewed by ______________________

Signed ______________________

ANNUAL PROGRAM PLAN (F-52-7A)

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STATE OF MINNESOTA
Department of Education
Vocational-Technical
Education Division

VOCATIONAL-TECHNICAL EDUCATION
District Summary

(Instructional Programs)

School Name ______________

County Code Number ______________

District Code Number ______________

	Secondary		Post-Secondary		Adult		Program Activities Related to Long Range Objectives	
	V.T.	Other	V.T.	Other	V.T.	Other	Secondary	Adult
1. Number of Teachers (Full-Time)								
A. Continuing								
B. Expanded								
C. New								
2. Number of Teachers (Part Time)								
A. Continuing								
B. Expanded								
C. New								
3. Number of Students								
A. Continuing								
B. Expanded M/F								
C. New								
4. Number of Program Hours								
A. Continuing								
B. Expanded								
C. New								
5. Number of Student Hours of Instruction								
A. Continuing								
B. Expanded								
C. New								

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ANNUAL PROGRAM PLAN (F-52-7A)

STATE OF MINNESOTA
Department of Education
Vocational-Technical
Education Division

VOCATIONAL-TECHNICAL EDUCATION
District Summary

(Financial)
(Direct Costs)

School Name_______________

County Code Number__________

District Code Number__________

	Secondary		Post-Secondary		Adult		Direct Financial Support Related to Long Range Objectives	
	V.T.	Other	V.T.	Other	V.T.	Other	Secondary	Adult
6. Salaries								
A. Continuing								
B. Expanded								
C. New								
7. Equipment								
A. Continuing								
B. Expanded								
C. New								
8. Supplies								
A. Continuing								
B. Expanded								
C. New								
9. Teacher Travel								
A. Continuing								
B. Expanded								
C. New								
10. Other Instructional Costs								
A. Continuing								
B. Expanded								
C. New								

ANNUAL PROGRAM PLAN (F-52-7A)

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STATE OF MINNESOTA
Department of Education
Vocational-Technical
Education Division

VOCATIONAL-TECHNICAL EDUCATION
District Summary

(Financial)
(Indirect Costs)

School Name ____________

County Code Number ____________

District Code Number ____________

	Secondary		Post-Secondary		Adult		Indirect Financial Support Related to Long Range Objectives	
	V.T.	Other	V.T.	Other	V.T.	Other	Secondary	Adult
11. 300 400 Health and Attendance								
12. 500 Pupil Transportation								
13. 600 Operation of Plant								
14. 700 Maintenance of Plant								
15. 800 Fixed Charges								
16. 900 Food Service								
17. 1000 Student Activity								
18. 1100 Community Service								
19. 1200 Capital Outlay								
20. 1300 Debt Service								

LOCAL LONG RANGE PROGRAM PLAN FO

DESCRIPTION OF THE NEED FOR OCCUPATIONAL EDUCATION

A. LABOR MARKET TO BE SERVED

(Characteristics of Regional Employment)

	Number of People Employed			Replacemen
	1970	1971	1977	1970
Professional				
Technical and Kindred				
Managers and Proprietors				
Clerical and Kindred				
Sales Workers				
Craftsmen				
Operatives				
Service Workers				
Laborers				
Farm Operators and Workers				
Total Employment				

	Under Skilled		
	1970	1971	1977
Professional			
Technical and Kindred			
Managers and Proprietors			
Clerical and Kindred			
Sales Workers			
Craftsmen			
Operatives			
Service Workers			
Laborers			
Farm Operators and Workers			
Total Under Skilled			

B. POPULATION TO BE SERVED

(In District)

SECONDARY

	1970	1971	1977
Public Enrollment Grades 9-12			
Private Enrollment Grades 9-12			
Institutionalized Persons Age 14-18 in District			
Out-of-School Youth Age 14-17			
Students 14 Years Old Below 9th Grade			
Total Secondary Population			

POST-SECONDARY

(In Region)

(For A.V.T.S. Use Only

30. 18-21 Year Olds
31. Unemployed Persons Over 21
32. Persons Entering the Labor Force
33. Institutionalized Persons Over 18 in District
34. Total Post-Secondary Population

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F 22-7

FOR VOCATIONAL-TECHNICAL EDUCATION

ac ement of Labor Force			Change in Labor Force			Need		
0	1971	1977	1970	1971	1977	1970	1971	1977
12. Total Manpower Need								

RY

	1970	1971	1977
e Only ds			
ersons			
ring the e			
lized er 18 t			
econdary			

ADULT
(In Region)

	1970	1971	1977
a. Updating			
b. Upgrading			
c. Retraining *(Adult Preparatory)*			
36. Total Employed Population			

DESCRIPTION OF THE TARGET FOR PUBLIC VOCATIONAL EDUCATION

A. LABOR MARKET FOR JOB PROFICIENCY TRAINING

VOCATIONAL EDUCATION	**Total Manpower Need** *(page 1, line 12)*
	Adjustment *(Need for Professional: page 1, line 1)*
	Total Target for Vocational Education *(line 36 minus l*
SECONDARY VOCATIONAL EDUCATION *(PUBLIC)*	**Secondary Target** *(page 1, lines 4,5,7,8,9,10 in the Ne*
	Adjustments *(page 2a, line 5)*
	Target *(line 39 minus line 40)*
(For A.V.T.S. Use Only) POST SECONDARY VOCATIONAL EDUCATION *(PUBLIC)*	**Post Secondary Target** *(page 1, lines 2,3,4,5,6,8 in the*
	Adjustments *(page 2a, line 13)*
	Target *(line 42 minus line 43)*
ADULT VOCATIONAL EDUCATION *(PUBLIC)*	**Adult Target** *(page 1, line 23 in the Under Skilled colu*
	Adjustments *(page 2a, line 20)*
	Target *(line 45 minus line 46)*

B. POPULATION TARGET FOR JOB PROFICIENCY TRAINING

SECONDARY	**Total Secondary Population** *(page 1, line 29)*
	Adjustments *(Students whose need is met by other metho page 2a, lines 22,23,24,25,26)*
	Target *(line 48 minus line 49)*
(For A.V.T.S. Use Only) POST SECONDARY	**Total Post Secondary Population** *(page 1, line 34)*
	Percent of 11th Graders on Last Year's MSAT Desiring Po Vocational Education *(page 2a, line 31)*
	Target of Vocational Education *(multiply line 51 by lin*
	Adjustments *(page 2a, line 13)*
	Target *(line 53 minus line 54)*
ADULT	**Employed Adults** *(page 1, line 35)*
	Number with Adequate Skill *(Enter 75% of line 56)*
	Total Vocational Education *(line 56 minus line 57)*
	Adjustments *(page 2a, line 20)*
	Target *(line 59 minus line 60)*

Page___of___Pages

	1970	1971	1977
e 1)			
minus line 37)			

	1970	1971	1977
the Need column)			

	1970	1971	1977
8 in the Need column)			

	1970	1971	1977
lled column)			

	1970	1971	1977
er methods:			
34)			
siring Post-Secondary			
51 by line 52)			
56)			
57)			

LONG RANGE PLAN FOR CONSUME

I. GENERAL PROGRAM

1.		Enrollment of Boys and Girls in Middle School and/or Junior High Scho
2.		Enrollment of Boys and Girls in Senior High School
3.		Total Enrollment *(add lines 1 & 2)*
4.		Enrollment in Consumer Homemaking in Middle School and/or Junior Hig
5.		Enrollment in Consumer Homemaking in Senior High School
6.		Total Enrollment in Consumer Homemaking Programs *(add lines 4 & 5)*
7.		Percentage of Total Enrollment in Consumer Homemaking Programs *(divi*
8.		Long Range Objective
9.		Total Cost of Current Enrollment
10.		Cost Per Student in Reimbursed Programs Only
11.	SECONDARY	Total Cost of the Long Range Objective
12.		Adult Population in School District
13.		Enrollment in Consumer Homemaking Programs Funded by Other Agencies (
14.		Target for Public Consumer Homemaking Programs *(line 12 minus line 1*
15.		Enrollment in Consumer Homemaking Programs
16.		Percentage of Target Being Met *(divide line 15 by line 14)*
17		Cost of Current Enrollment in Adult Consumer Homemaking Programs
18.		Cost Per Person Enrolled
19.	ADULT	Cost of the Long Range Objective

II. SPECIAL NEEDS PROGRAMS

		19
20.	Number of Persons to be Served in Pre-school and Kindergarten through Elementary	
21.	Number of Persons to be Served in Middle School and/or Junior High and/or Senior High	
22.	Number of Persons to be Served Who Are Youths Not Currently Enrolled in School *(Examples are dropouts, pushouts, persons who are in correctional institutions, mental institutions, institutions for the physically and mentally handicapped, and persons who are hospitalized)*	
23.	Number of Adults to be Served *(Included in this category are persons who are in correctional institutions, mental institutions, institutions for the physically and mentally handicapped, one parent families, underemployed persons, and persons disadvantaged by incomes below the poverty level)*	

Page___of___Pages

SUMER HOMEMAKING PROGRAMS

	1970	1971	1977
gh School			
ior High School			
& 5)			
(divide line 6 by line 3)			
encies *(line 6 of Part II)*			
line 13)			
ams			

	1970	1971	1977
s *nd*			
d			

II. NUMBER OF PERSONS SERVED BY CONSUMER HOMEMAKIN PROGRAMS FUNDED BY OTHER AGENCIES
(Total and/or partial funding)

	1970	1971	1977
1. County Cooperative Extension			
2. United Fund			
3. Office of Economic Opportunity			
4. Welfare Agencies			
5. Other			
6. Total Persons to be Served			

ADJUSTMENTS TO TARGETS FOR JOB PROFICIENCY TRAINING

A. IN THE LABOR MARKET

		1970	1971
SECONDARY	Neighborhood Youth Corps *(In School)*		
	Unreimbursed Occupational Programs		
	Vocational Adjustment Coordinator *(Work Study)*		
	Training in Industry	X	X
	Total *(Add lines 1-4)*		
(For A.V.T.S. Use Only) POST SECONDARY	Private Occupational Education		
	Manpower Development and Training Act *(Full Time)*		
	Department of Labor Training Programs		
	Training in Industry	X	X
	Apprenticeship Training		
	Training in Military		
	Other		
	Total *(Add lines 6-12)*		
ADULT	Manpower Development and Training Act *(Part Time)*		
	Small Business Administration		
	Department of Labor Training Programs		
	Training in Industry	X	X
	General Extension		
	Other		
	Total *(Add lines 14-19)*		

B. IN THE POPULATION

		1970		1971	
		Number	%	Number	%
SECONDARY*	Employment				
	A.V.T.S.				
	Private Vocational Education				
	Four-Year College *(Public and Private)*	✓			
	Junior College				
	Training in Military				
	Institutionalized				
	Unemployed				
	Other				
	Total *(Add lines 21-29)*				

POST SECONDARY - Same as A-POST SECONDARY above.

ADULT - Same as A-ADULT above.

---

*Projected profile of students leaving school--graduates and other school leavers.

Page___of___Pages

IV. TARGETS FOR OTHER SECONDARY PROGRAMS

A. SKILL DEVELOPMENT

		1970	1971	1977
31.	Students planning to attend an area vocational-technical school			
32.	Students planning to attend private vocational school			
33.	Students planning to attend a vocational program in a junior college or college			
34.	Students planning to enroll in a vocational teacher education program			
35.	Total *(Add lines 31-34)*			

B. ORIENTATION TO THE WORLD OF WORK

	EXPLORATORY	1970	1971	1977
36.	Unemployed			
37.	Employed in a job not related to first job			
38.	Employed in a job not related to training			
39.	Entered but did not complete post-secondary education			
40.	Total *(Add lines 36-39)*			

	BASIC VOCATIONAL SKILLS AND ATTITUDES	1970	1971	1977
41.	Line 40 from above			
42.	16 year olds leaving school (W5-W14)			
43.	Total *(Add lines 41-42)*			

1977

1977	
Number	%

PROGRAM INVENTORY RELATED TO TARGET

A. SECONDARY	**Target** *(page 2, lines 41 and 50)*	
	Output *(number of students from To Continue Present Programs--*	
	Percent of Target Being Met *(line 62 divided by line 61)*	
	Long Range Objective	
		1970
	Total Cost of Current Output *(line 63)*	
JOB PROFICIENCY TRAINING	**Cost Per Student in Reimbursed Programs Only**	
	Total Cost of the Long Range Objective *(line 64)*	
	Target *(page 2a, line 43)*	
	Output *(number of students from To Continue Present Programs*	
	Percent of Target Being Met *(line 69 divided by line 68)*	
	Long Range Objective	
		1970
BASIC VOCATIONAL SKILLS AND ATTITUDES	Total Cost of Current Output *(line 69)*	
	Cost Per Student in Reimbursed Programs Only	
	Total Cost of the Long Range Objective *(line 71)*	
	Target *(page 2a, line 40)*	
	Output *(number of students from To Continue Present Programs--*	
	Percent of Target Being Met *(line 76 divided by line 75)*	
	Long Range Objective	
		1970
	Total Cost of Current Output *(line 76)*	
	Cost Per Student in Reimbursed Programs Only	
EXPLORATORY	Total Cost of the Long Range Objective *(line 78)*	
	Target *(page 2a, line 35)*	
	Output *(number of students from To Continue Present Programs--*	
	Percent of Target Being Met *(line 83 divided by line 82)*	
	Long Range Objective	
		1970
	Total Cost of Current Output *(line 83)*	
	Cost Per Student in Reimbursed Programs Only	
SKILL DEVELOPMENT	Total Cost of the Long Range Objective *(line 85)*	
B. POST SECONDARY	Target *(page 2, lines 44 and 55)*	
	Output *(number of students from To Continue Present Programs--*	
	Percent of Target Being Met *(line 90 divided by line 89)*	
	Long Range Objective	
		1970
	Total Cost of Current Output *(line 90)*	
	Cost Per Student in Reimbursed Programs Only	
	Total Cost of the Long Range Objective *(line 92)*	
C. ADULT	Target *(page 2, lines 47 and 60)*	
	Output *(number of students from To Continue Present Programs--*	
	Percent of Target Being Met *(line 97 divided by line 96)*	
	Long Range Objective	
		1970
	Total Cost of Current Output *(line 97)*	
	Cost Per Student in Reimbursed Programs Only	
	Total Cost of the Long Range Objectives *(line 99)*	

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LABOR MARKET			POPULATION		
1970	1971	1977	1970	1971	1977

ams--ANNUAL PLAN)

70	1971	1977

1970	1971	1977

ams--ANNUAL PLAN)

70	1971	1977

1970	1971	1977

ams--ANNUAL PLAN)

70	1971	1977

1970	1971	1977

rams--ANNUAL PLAN)

70	1971	1977

1970	1971	1977	1970	1971	1977

rams--ANNUAL PLAN)

70	1971	1977

1970	1971	1977	1970	1971	1977

rams--ANNUAL PLAN)

70	1971	1977

AN OVERVIEW FOR THE APPLICATION OF COMMUNITY RESOURCES RELATIVE TO SPECIFIC EDUCATIONAL NEEDS

Prepared for:

INSTITUTUE IX

METROPOLITAN AREA APPLICATION
OF
VOCATIONAL EDUCATION INNOVATIONS
RESULTING FROM
RESEARCH AND DEVELOPMENT PROGRAMS
Albuquerque, New Mexico

by

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AN OVERVIEW FOR THE APPLICATION OF COMMUNITY RESOURCES RELATIVE TO SPECIFIC EDUCATIONAL NEEDS

Introduction

According to the Vocational Education Amendments of 1968, opportunities for vocational education should be provided so that all individuals "will have ready access to vocational training or retraining which is of high quality, which is realistic in light of actual or anticipated opportunities for gainful employment, and which is suited to their needs, interests, and ability to benefit from such training." It is readily apparent that a major chasm exists between available opportunities and individual needs. As Burkett noted, "a minimum of 17 million people need access to vocational education in addition to the nine million now in such programs."[1] Koble reported that about 60 percent of the students leave secondary schools inadequately prepared to enter the work world.[2] From the standpoint of the number of individuals affected, it is obvious the condition identified above is not uniformly distributed across residential and geographical areas. By 1980, approximately 3/4 of the population of the United States will be living in metropolitan areas.[3] Consequently, it is of crucial importance that viable and innovative changes be introduced in metropolitan areas which will facilitate the planning, development, and strengthening of the vocational education program. Such changes are mandatory if vocational education is to more closely achieve its previously stated goal.

Initially, the purpose of this paper is to describe in skeletal form a model which has the potential, if fully developed and implemented, to insure greater use of community resources (personnel, equipment, facilities, money) and improve the effectiveness of the vocational education

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1. Lowell A. Burkett, "Access to a Future" American Education, 5 March 1969, p. 2.

2. Daniel E. Koble, "Vocational Education -- The Third Dimension," Business Education Forum, V (October 1969), p. 5.

3. Robert J. Havighurst, "Metropolitan Development and the Educational System," School Review, 69 (Autumn 1961), p. 251.

program. Vocational education is provided in several types of institutions, at various levels, under a diversity of conditions, and for a number of objectives. It would be extremely difficult to develop a model which has relevancy and utility for the vast and heterogeneous vocational education enterprise in general. As such, it was necessary to restrict the scope and focus of this model. The proposed model has applicability for that level of vocational-technical education generally identified as post-secondary. Institutions involved in post-secondary occupational education are known by such designations as area schools, technical institutes, and junior or community colleges. The model is designed primarily to advocate structural changes which have the possibility of alleviating four major sources of problems which relate directly to students -- recruitment, retention, placement, and follow-up. The decision to develop a model which is oriented toward the post-high level, rather than another sector of vocational education, seems justified because of recent changes in the broader society. Many new and/or advanced levels of work skills and knowledge required for effective job participation in our technological society cannot be met by high school vocational programs. Although the statement "that much, if not nearly all, of the occupational education of the future will have to be conducted at post-high school levels,"[4] is an exaggeration, it is apparent that post-high occupational education is more significant than ever before.[5] In addition, the available resources which exist to support this level of education are frequently not effecitvely utilized.[6]

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[4] Norman C. Harris, "Curriculum and Instruction in Occupational Education," in Emphasis: Vocational Education--In the Two-Year College (Washington, DC: American Association of Junior Colleges, 1966), p. 60

[5] Robert M. Knoebel, "Post Secondary Occupational Education: Phenomenon of this Generation," American Vocational Journal, 43 (April 1968), p. 15

[6] For example, see: G. Ross Henninger, The Technical Institute in America, (New York: McGraw-Hill, 1959), p. 58; C. C. Metx, "Sixth Survey of Engineering Education, 52 (April 1961), pp. 113-115; and John F. Van Derslice, "Technical Students' Characteristics," Industrial Arts and Vocational Education, 57 (February 1968,), p. 81.

The second purpose of this paper is to present suggested guidelines outlining the sequential steps to be followed in the instigation of planned social action in a community area. Although the guidelines do not refer to the proposed model, it should be emphasized that it would be almost impossible to design and execute a model having community-wide implications unless steps similar to those suggested are followed.

In summary, this paper has a two-fold purpose: (1) to present a model which as the potential of facilitating a greater utilization of community resources, particularly on the post-secondary level of vocational education in metropolitan areas; and (2) to suggest guidelines intended to maximize the possibility of engendering social action conducive for greater utilization of community resources as they pertain to vocational education.

A CLEARINGHOUSE FOR MORE EFFECTIVE UTILIZATION OF RESOURCES RELATIVE TO POST-HIGH VOCATIONAL EDUCATION: A MODEL

It is commonplace knowledge that most organizations are less than successful in effectively managing avilable resources because the functions they perform are repeatedly unstructures, uncoordinated, and unsystematized. Problems of effort articulation and cooperation are often more common than unique. This is particularly the case when several organizations, although sharing certain aspects of common goals, work relatively independent of one another in the pursuance of these goals. To a considerable extent, the above situation characterizes the efforts directed toward the recruitment, retention, placement and follow-up of post-high vocational students.

The problems associated with the recruitment, retention, placement and follow-up of post-high vocational students are extremely complex and vary considerably as to nature, intensity, and source. Although the following model is quite encompassing, it is impossible for a single recommendation to have the potential to mitigate all the problems impeding these relevant processes. Only a brief and embryonic version of the model will be presented. A more completed version and its eventual implementation in a metropolitan area will likely result in a greater utilization of resources for this spectrum of the vocational-technical education process.

Most post-secondary occupational recruitment programs represent efforts that are noncontinuous, relatively unsystematic, and uncoordinated. In most cases, emergency crash-programs of recruitment are employed resulting from immediate industrial or educational needs.[7] Notwithstanding the danger of over-generalization and simplification, most of the techniques used presently in the recruitment of students can be subsumed under what may be termed the "mass communication" approach. If some of the major impediments to the vocational student recruitment process (e.g., middle-class bias of counselors, parental pressure for children to enroll in baccalaureate programs, student awareness that the vocational programs and subsequent related jobs are accorded limited prestige) are recognized, it seems apparent that "mass communication," per se, cannot be effective as a recruitment means.

It is recommended that new, unique, and multi-functional structures (organizations) are requisites before some of the problems negatively impinging upon the selective growth of post-high vocational schools and more successful occupational placements are alleviated.[8] In the process, these proposed multi-functional structues will be instrumental in effecting a much greater use of existent resources. Central to the proposed organization is the concept of the interstitial group.[9] This concept refers to a group whose function is to connect groups together so as to more effectively realize goals that are of mutual interest. Members of the interstitial group are drawn from other groups and represent these groups in the interstitial or inbetween relational system. The rationale for joining other groups together is to make an exchange of products, services, or functions possible, to provide a means of coordinating or synchoronizing their activities or to control the potential conflict or competition between them. The subsequent paragraphs in this section are primarily concerned with the manner by which the interstitial group concept can be operationalized in the form of organizations concerned with the recruitment-placement processes as they involve prospective occupational students and graduates of post-secondary vocational-technical programs.

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[7] Samuel M. Burth, Industry and Vocational-Technical Education, (New York: McGraw-Hill, 1967), p. 211.

[8] A similar description of the model was proposed previously by the author and may be found in another source. See Albeno P. Garbin, "Post-Secondary Vocational-Technical Education: Some Consideration Relating to the Student," in Aaron J. Miller and Carroll R. Hyder (eds.), Position Papers and Discussion Groups' Notes from the National Conference on Post-Secondary Vocational- Technical Education (Columbus, Ohio: The Center for Vocational and Technical Education, The Ohio State University, 1970), esp. pp. 42-26.

[9] Frederick L. Bates, The Structure of Occupations: A Role Theory Approach (Raleigh: North Carolina State Unicersity, Center for Occupational Education, 1968), p. 169.

Basically, it is suggested that structurally separate organizations be established, staffed primarily with individuals representing other groups or organizations, that individually and collectively, directly to indirectly, stand to benefit from a lessening of the problems besetting the recruitment-placement of post-high school occupational students. The persons composing a particular interstitial organization will tend to represent the high schools, the post-high vocational-technical institutions, industrial-business organizations, and perhaps other interested groups in a particular metropolitan area. Each category of personnel employed for the proposed organization will owrk in conjunction with counterparts located in each of the organizational settings identifed above.

The term "clearinghouse" is appropo in describing the proposed structure because the suggested organization would be a central agency for the collection, classification, and distribution of information, as well as people and equipment.

The collection function of a clearinghouse would include the systematic, organized, and periodic gathering of data with reference to the following (1) personal record data from the high schools about their enrolless that may be useful for guidance and counseling purposes; (2) present and anticipated occupational needs and requirements, program descriptions, etc., of post-secondary vocational schools; (3) information on the placement and follow-up of post-secondary school graduates; (4) admissions and graduation requirements program descriptions, etc., of post-secondary vocational schools, and (5) compilation of the names of resource personnel living in the area who are qualified by experience to contribute to the learning experience of students.

The classificatory functional area would involve the performance of at least two major related roles. Clearinghouse personnel would screen student records for the purpose of determining who have the potential to benefit from vocational training on the post-secondary level. Those prospective students identified would be contacted; interested students and parents would participate in counseling service with a clearinghouse counselor. Subsequently, the high school student would be classified as to the vocational program that appear congruous with his values, interests and abilities, as well as anticipated labor market needs.

The functions pertaining to distribution include both the dissemination of information, the distribution of people, and the distribution of equipment. Information dissemination relates to the following: (1) providing information to the high schools conerning post-secondary schools and programs and the available jobs contigent upon having received post-secondary occupational training; (2) providing the names and coordinating the assignment of volunteer resource people who can contribute to the realistic learning experiences of students; (3) relaying data to curriculum personnel on the post-secondary level about the emergence of new jobs and the upgrading of skills that are essential if the curriculum is to be correlated with available employment opportunities; (4) keeping the industrial-business organizations posted as to the number of people being trained and their area of skill competency; and (5) informing admissions offices about prospective vocational students if they have not already enrolled.

Clearinghouse roles pertaining to the distribution of people include: (1) referring high school students to specific post-high schools offering programs compatible with their interests, values, and abilities; and (2) providing counseling to graduates of post-secondary programs and referring them to organizations in need of their skills.

Another major distributive function of the clearinghouse would be to coordinate the assignments and distributions of certain equipment to the post-secondary schools in the area, when the schools have need for such equipment. This function is dependent upon the centralization of costly and periodically used equipment in one central metropolitan "equipment pool."

Most of the functions to be carried out by the "clearinghouse" are presently being performed, in one degree or another, in many areas of the country. However, the efficacy of these activities can generally be challenged because high schools, post-secondary schools, and industrial-business organizations, rather than joining together in concerted and cooperative effort to realize common goals, often tend to work independently and competitively. The proposed centralization of recruitment-placement functions, based on an integrated and exhaustive system of communication, cooperation, and organization should reduce some of these problems. Furthermore, it is likely that the costs incurred by a wholistic approach on the metropolitan level would be cheaper than the many individualistic attempts. Maximum utilization of resources is only an ideal; however, the suggested model should yield results which will more closely approximate this ideal.

If the clearinghouse concept is developed, implemented and institutionalized, the benefits enumerated below are likely to result.

1. A communication network would emerge which provides significant data relating to recruitment and placement; decision making on all levels would have a more rationale basis.
2. The establishment of a clearinghouse in a particular metropolitan area would lend greater legitimation to the post-high vocational education process. In due time, more prestige is likely to be accorded this type of education.
3. Exposure to the existence of a clearinghouse would induce students to begin recognizing that there are other alternatives following high school besides "going to work" or "going to the university."
4. Implicit in the "clearinghouse" concept is the idea that students have different kinds of abilities rather than a gradation of ability. The utilization of recruitment procedures that reflect this orientation will foster its development and dissemination.
5. Effort at selectively recruiting students for post-high job training will secure a greater number of enrollees for these programs. Furthermore, if the criteria for selection are realistic, the retention rates will likely increase.

6. The multiple-school usage of expensive equipment will make it possible for more schools to have access to necessary equipment. Furthermore, it will reduce the amount of money required for equipment purchases.
7. A cataloging and coordination of the names and assignments of volunteer resource people living in the metropolitan area will make available numerous individuals whose direct participation in the pedagogical process will greatly enrich the vocational-technical programs of study.
8. Vocational educational institutions beyond the high school will be in a position to be more responsive to the needs of a changing society. The course content of vocational programs will be more compatible with the training demands of business and industry; there will be more employable people for available jobs.

THE SOCIAL ACTION PROCESS: SOME GUIDELINES

Any model designed to intitiate change, the successful implementation of which is dependent upon the support of various community groups, factions, and "key" individuals is doomed to fail unless these parties have been actively involved in the development of that model. Obviously, commitment, involvement, cooperation, and support are more easily obtainable at the model implementation stage, if they were sought and received at the model design stage. Inview of the above, the procedural steps in the social action process which might lead to a greater utilization of community resources and a subsequent improvement in the vocational education programs of metropolitan areas are enumerated and discussed below.[10]

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10. These guidelines have been used with considerable success in several Georgia communities. The discussion parallels closely that presented by Harold L. Nix in Community Social Analysis of Athens-Clarke County (No. 6 of Community Social Analysis Series, Institute of Community and Area Development and Department of Sociology and Anthropology, University of Georgia, Athens, 1969), especially pp. 84-96.

1. Recognition of a Need to More Effectively Use Community Resources for Improving the Vocational Education Program

Planning which will most likely lead to social action and change is initiated with the identification and definition of a problem which should be resolved. In this case the problem can be specified in the form of a question: "What can metropolitan areas do which will facilitate greater utilization of community resources and result in a more effective vocational education program? A statement of the problem would include the following: (1) its relevancy; (2) expected benefits if the problem is reduce; (3) probable costs attributed to continual neglect of the problem; and (4) evidences of overlapping and conflicting efforts which have not been successful in ameliorating the problem. As much as possible, the preliminary problem statement should be well documented with available studies, records and other data.

2. Identification of Relevant Organizations, Leaders and Factions

The next step concerns the determination of significant organizations, leaders and factions which should be involved in the planning process. These would include the following: (1) legitimizers, or the top community influentials; (2) key educational administrative figures; (3) leaders of the most influential organizations, expecially industrial-business and union representatives; (4) leaders of factions and those who can serve as go-betweens; (5) leaders of special groups who are under-represented in the top organizations (the poor, blacks, or other disadvantaged groups); (6) specialists having "expertize" in the problem area; (7) those who control or support the educational program, such as school board officials, the state educational department, professional and business association, etc, and (8) planners representing interested agencies. This composite group of individuals will not be as large as might be surmized by examining the extensive listing. There is likely to be considerable overlap in the leadership.

3. Initiation and Legitimization of the Need to More Effectively Use Community Resources for Improving the Vocational Education Program

Subsequent to the definition of the problem and the identification of the important leaders and organizations, the problem should be initiated in the community beyond the small group responsible for first defining it. The team responsible for accomplishing this would be generally composed of two basic types of individuals. One type includes individuals who by virtue of their position and knowledge can speak authoritively about the need to re-direct community resources for a more effective system of vocational education. If the first type are not well known and share a close relationship with the community's influentials, there would be a need for persons who have an entree to the influentials and are sympathetic to the proposed planning and action program. The basic purpose underlining this step is to sound out, solicit approval and suggestions from the "key" people in the cummunity.

4. Diffusion of a Need to More Effectively Use Community Resources for Improving the Vocational Education Program

At this stage, the base of community involvement is broadened. If other individuals and groups will be required to support the planning effort and its implementation, it will be necessary to inform and convince them of the merits of the program. Educating the public calls for a different type of salesmanship; showmanship, zeal, and oratory are required. The function of the diffusion team is to convince the public that a more effective vocational education system is needed, and that the community as a whole would benefit by such a development. Some of the techniques available for accomplishing the diffusion goal include the use of a speaker's bureau for civic organizations, community adult education seminars, and the mass media.

5. Organization for Determining How to Make More Effective the Use of Community Resources for Improving the Vocational Education Program

After it is fairly certain that the problem is generally recognized and broad community support exists that it should be alleviated, the question arises as to which group or organization should be given the responsibility to develop the plans for realizing this end. Three basic approaches to the selection of an organization for planning can be identified: (1) hire an agency or firm to conduct the study and make recommendations; (2) assign the task to an existing community organization; and (3) create a new organization specifically for the planning program. In addition, combinations of these three are also possible. In larger communities, the third approach is likely to be the most successful.

6. Studying and Planning to Make More Effective the Use of Community Resources for Improving the Vocational Education Program

If any effort which as as its objective the introduction of change in a community is to be successful, it must be based upon (1) the participation of lay citizens., (2) goal priorities as to relative importance and logical sequence, and (3) a plant of action desgined to implement the goals. A plan of action should include the following components: (1) a priority of goals to be accomplished; (2) the means whereby the goals can be achieved; (3) provisions for financing the activities; (4) a time schedule; (5) a fairly specific allocation of tasks and functions; (6) arrangements for supervision, communication, and coordination required in pursuing the activities; (7) implementation of the plan of action; (8) evaluation of the plan; and (9) plans for continuation of the study-planning-action-evaluation program.

SUMMARY

Two basic proposals were advanced in this paper. The ultimate objective of each was to make recommendations having the potential for improving and making more effective the vocational education systems in metropolitan areas.

More specifically, one of the proposals represented a model which had greater applicability for post-secondary occupational students. In essence, it was suggested that for a given metropolitan area, the community resources could be more efficiently used of certain relevant resources were pooled in one newly created organization (clearinghouse). In particular, it was felt that the problems associated with the recruitment, retention, placement, and follow-up of post-secondary vocational students would be minimized.

Guidelines relative to the community social action process were also presented. Adherence to these guidelines, or a comparable series of steps, is a requisite if the planned social change has broad community implications and is depended upon general community support.

USING THE DELPHI TECHNIQUE AND SIMULATION EXERCISES IN IMPLEMENTING PLANNED PROGRAM CHANGE IN VOCATIONAL EDUCATION

Prepared for:

INSTITUTE IX

METROPOLITAN AREA APPLICATION
OF
VOCATIONAL EDUCATION INNOVATIONS
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RESEARCH AND DEVELOPMENT PROGRAMS
Albuquerque, New Mexico

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USING THE DELPHI TECHNIQUE AND SIMULATION EXERCISES IN IMPLEMENTING PLANNED PROGRAM CHANGE IN VOCATIONAL EDUCATION

The scope and content of this paper has been changed from that originally assigned. When the Institute director contacted me earlier this year, he asked if I would present a paper entitled "Simulation Exercises and Their Implication for Implementing Planned Program Change in Vocational Education." In later conversations, we agreed to alter the focus by expanding it to include other than just simulation. The paper might well be entitled "Old Wine in New Bottles" or more appropriately "Using Old Tools in a New Way to Perform a Much Needed Task."

The approach will be that of describing techniques from the vantage point of a practitioner. Most of this paper consists of descriptions of activities that I have been engaged in as a person having some responsibility for planning within a College of Education in a very large university. Inasmuch as possible, examples relating to vocational education are provided.

Instead of dealing exclusively with simulation, a portion of the paper will deal with the utilization of Delphi Technique in planning efforts. While these two techniques might seem to be unrelated, I will attempt to show how both can be useful in the planning process.

The concept which is paramount in this paper and to this institute is that of planned program change. This is the era of planning and futures projection. If we were to look at the titles of conferences being held all over the country for the past couple of years (and probably for a few years to come), one would note an extraordinary emphasis upon words such as "planning" or "change." I need not document that fact, I expect, because I am speaking to a group of convention attenders and program planners. Nor need I document some of the reasons for this kind of emphasis. Technological and sociological phenomena are forcing out educational systems to behave in manners which bring about this kind of emphasis in conferences and conventions.

In that the emphasis is on planning, it would seem appropriate to define planning and to identify some of the steps that I see in this planning process. Planning is much more than trying to predict what is going to happen in the future. Such prediction might better be left to fortune-tellers. The intelligent man not only tries to anticipate the future but indeed attempts to control it. The process of so doing, we refer to as planning. It is difficult and probably foolhardy to attempt to make clear distinctions between planning and decision making. Planning obviously is part of the decision making process as is decision making part of the planning process. One difference sometimes noted is that in planning, the emphasis is on the future. It's something we attempt to do prior to the time we must take action. That is, it is anticipatory decision making. Ackoff defines planning as "a process that is directed toward producing one or more future states which are desired and which are not expected to occur unless something is done."[1]

The steps in this planning process might be broken out as follows: (1) appraising the future political, economic, and social environment; (2) ascertaining the desired role of the individual or organization (as the case may be) in this environment; (3) anticipting and perceiving the needs and requirements of the client groups of the organization or individual; (4) setting up a system of communication and information flow so that members of the organization can participate in this planning process; (5) developing the broad goals, objectives and plans which will direct the efforts of the total organization; (6) translating this broad, general planning into some functional efforts on a more detailed basis as, for example, instruction, service, or development; (7) developing the more detailed planning and control of resource allocation within each of these areas -- in other words, programming the effort by assigning personnel and other resources to activities.

The Delphi Technique

A Description of the Technique. The Delphi Technique is an approach

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1. Russel L. Ackoff, A Concept of Corporate Planning (New York: Wiley-Interscience, 1969,) p.3.

that can be used in the planning process especially in that part of the process having to do with appraising the future political, economic, and social environment, ascertaining the role of the organization in this environment, and anticipating and perceiving the needs and requirements of client groups.

The Delphi Technique was developed by Olaf Helmer and his colleagues at Rand Corporation in the early 1950's to obtain group opinions about urgent defense problems. About five years ago, an unclassified description of the technique was published and the procedure is being employed presently in a number of settings, including education.

The technique, which is built on the strength of informed intuitive judgement, is intended to get expert opinion without bringing the experts together in any kind of a face-to-face confrontation. Contact is generally made with the experts through successive questionnaires and feedback with each round of questions being designed to produce more carefully considered group opinions. Pfeiffer presents the following variation of the procedure.[2]

1. The first questionnaire may call for a list of opinions involving experienced judgement, say a list of predictions or recommended activities.

2. On the second round, each expert receives a copy of the list and is asked to rate or evaluate each item by some such criterion as importance, probability of success, and so on.

3. The third questionnaire includes the list and the ratings, indicates the consensus, if any, and in effect asks the experts either to revise their opinions or else to specify their reasons for remaining outside the consensus.

4. The fourth questionnaire includes list, ratings, and consensus and minority opinions. It provides the final chance for revision of opinions.

While the procedure has been used extensively in predicting long-range developments in defense, automation, space research and other scientific-technological areas, it can also be used to advantage to encourage convergence of opinion or at least a majority opinion and a clearly-defended minority opinion as a basis for predicting long-range developments in education and formulating goals and setting priorities.

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[2] John Pfeiffer, New Look at Education, (Poughkeepsie, NY: Odyssey Press, 1968), pp. 152-157.

I see two possible ways in which use of the Technique might profit those of you who have responsibility for planning vocational education programs. The first is much like that originally suggested by Helmar and his colleagues and follows the pattern of the Pfeiffer variation which I have just delineated. The second has to do with setting goals and priorities on programs.

Predicting Future Events in Education. In the first case, vocational education is an area which is subject to a dramatic change because of the rapidly changing technology. Because there is some basis for predicting this change in technology, it would appear that you have much to gain from the use of the Technique in planning for the future. Let me illustrate. The first step in the Delphi would call for a panel of experts being asked to generate a number of predictions about the future which would have impact on vocational education. Such a list might include statements such as the following:

Developments[3]

1. Weather and climate control will increase the agricultural production of the State of Jefferson by fifty percent.
2. The length of the work week for at least half of the blue collar workers in Jefferson will be 25 hours or less.
3. Ninety-five percent of all children in Jefferson will complete at least fourteen years of schooling.
4. No one in the State of Jefferson shall be more than 30 miles (45 minutes) form a vocational-technical school offering instruction in at least six engineering technology programs and six business and health related occupation programs.
5. It will be possible to exercise genetic control or influence over the "basic constitution" of an individual.

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[3] These examples are very different and normally would not appear on the same questionnaire.

The examples may not be very good and they certainly are of a different order, but they do illustrate some of the future developments impacting on the area of vocational education. After generation of such a list and as step two in the Delphi, the experts would be asked to predict the date at which these events might occur. It is likely some experts may respond that a particular event or development would never occur. The experts would then be asked to send these predictions back to the person responsible for the colation and feedback. On receipt of these data, the person managing the Delphi would calculate some kind of consensus statistic. In most cases in which the Delphi has been used in this manner, the statistic used has been the inter-quartile range. In other words, the Delphi manager would calculate the 25th and 75th percentiles of those dates predicted and record those dates.

In round three of the Delphi, the experts would receive an instrument such as the following.

Questionnaire #3

Development	Your Previous Estimate	Consensus Estimate (IQR)	Your New Estimate	Reason your Estimate is Below or Above IQR
1. Weather and climate control will increase the agricultural production of the state of Jefferson by fifty percent.				

Respondents are now asked to give a new estimate of the date at which the development will occur in light of new data, that being estimates coming from other experts. It is particularly important at this stage to call on experts to use their experience and knowledge and not be coerced to join the consensus group. As you will note, they are given opportunity and should be encouraged to provide reasons based on their own expertise why their estimate is either above or below the inter-quartile range. Once again, the questionnaires are returned to the Delphi manager and inter-quartile ranges are recalculated.

Round four of the Delphi calls for sharing with each expert his most recently estimated date for each development, the recalculated inter-quartile range, and the list of reasons offered by all experts for choosing dates outside the range. Unlike committee meetings or other personal confrontations, the strength of the argument, not the personality or status of the person making the argument, is the single most important influencing agent. In this round, if experts do not agree with the consensus, they are asked to challenge the arguments given in favor of the opposite end of the inter-quartile range from their own. (If an expert's estimate is on the high side of the IQR, he is asked to refute the low estimate.) The Delphi Technique can go through a number of rounds similar to round four, but generally five or six is adequate.

A slight modification of the Delphi which relates to the concept of planning as anticipating and attempting to control the future is as follows: Experts are asked early in the process to make a value judgement as to whether or not the development is "good" or "bad." Assuming that a large number of experts feel that a certain development is "bad," they are asked to identify the kinds of policy decisions which would slow down or hinder the development or event. Conversely, if the development were considered to be very desirable on the part of the experts, they would be asked to identify strategies or decisions by which the development might be accelarated. As one might expect, there will be developments where one will get some marked splits in opinion regarding desirability; the example regarding genetic control on influence over the basic constitution of the individual might well be such a case.

Using the Delphi Technique and the results obtained from others who have used it in this manner seems extraordiarily fitting to those persons working in vocational education.[4]

Setting Goals and Priorities. Yet another use that can be made of the Delphi is that of generating goals, objectives, or target conditions, and setting priorities on those targets. It is in this area that we have used the technique extensively in the OSU College of Education and in the county school systems in the state. The first round involves the generation of the objectives or target conditions. After experimenting a great deal, we have used rather successfully a sentence such as the following to generate that first set of conditions.

> During the decade ahead, the Jefferson State Division of Vocational Education should concentrate its energies and resources on . . . .

Respondents or experts are asked to provide six to ten endings to that sentence. After testing a number of different kinds "generating" sentences, we found it important to focus upon energies and resources, both of which are basic to priority setting. Once those items come in, the task of the person responsible for managing the Delphi becomes a very crucial one. It is difficult but not impossible to synthesize the diverse kinds of responses that come to this kind of an open ended question. After having worked with large numbers of experts in a couple of different settings, we have found it to be best for three or four people to synthesize these results independent of one another. Their efforts can then be brought together to prepare for the next round. In the second questionnaire, participants are asked to indicate priorities they would attach to those target conditions. An example follows:

> Questionnaire #2
>
> After each of the statements, indicate the priority you would attach to the target condition using the following key:
>
> 1. Top priority
> 2. Second priority
> 3. Maintain at present level
> 4. Reduce or discontinue activity or service -- do not initiate activity in this area.
>
> In order to face up to the reality of scarce resources, you must distribute your priority rankings in such a manner that you will have an equal number of 1's, 2's, 3's, and 4's.

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[4] Personnel at the Education Policy Research Center at Syracuse University have made extensive use of the Delphi Technique in their work.

During the decade ahead, the Jefferson State Division of Vocational Education should concentrate its energies and resources on:5

1. Assisting vocational schools in the assessment of existing and experimental programs.

2. Conducting vocational-technical education needs assessment in the State.

3. Providing in-service opportunities for the State's vocational-technical school teachers.

4. Doubling the number of vocational-technical teaching stations in Jefferson.

5. Improving internal communications (within the Division and within the Jefferson State Department of Education.)

6. Providing services, i.e. centralized purchasing and accounting, to the State's Vocational-Technical Schools in order to increase their efficiency.

Once the results are in, the Delphi manager calculates the consensus statistic. We have used the mode and a weighted mean for that statistic and found the latter to be far superior. Much as in the earlier example cited, the expert is then asked to respond as follows.

Questionnaire #3

Accompanying each of the statements (a) are your previous response (b) the consensus response, (c) and spaces to record your new response, (d) and the reasons for the variation between your new response from the consensus response if indeed there is a variation.

During the decade ahead, the Jefferson State Division of Vocational Education should concentrate its energies and resources on:

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5. Some of these statements are of a different nature and normally would not appear on the same questionnaire.

Statement (a)	Your Previous Response(b)	Consensus Response(c)	Your New Response(d)	Reason for variation between c & d
1. Assisting vocational schools in the assessment of existing and experimental programs.				

Experts are provided their previous response, consensus response of the group and are asked to make a new response. Any variation between the consensus response and their new response is to be justified. Just as in the previous example of Delphi Technique utilization, it is extremely important that participants be urged to use their expertise in citing reasons for any variation between the consensus response and their new response.

Round four is much the same as round three with the exception that experts are provided a listing of arguments for assigning priorities higher or lower than the group priority ranking. These arguments are to be taken into consideration in making the new response. As before, this can be run through a number of cycles, each one from this point being much the same.

In addition to providing data for making priority decisions, this use of the Technique provides the participants with some first hand experience with the problems of resource allocation. One of the major problems in this kind of goal setting exercise is that of identifying the expert group. It is very tempting to include in this group all who are influenced substantially or who can make a significant and/or unique contribution to the resolution of the problem. Once the number of experts gets beyond 25 or 30, handling the data (especially the arguments advanced) becomes exceedingly cumbersome. We have had some good experience using two man teams of experts as a solution to the numbers problem.

There are many other possible uses of the Delphi which might be relevant to your work. As an example, one of our Ph.D. students is currently using the Technique to identify competencies needed by personnel employed in program planning in state divisions of vocational technical education.

Simulation

Description of Simulation. The word simulate is derived from the Latin word simulatus, which means to represent, imitate, or feign. A dictionary definition of simulation is that of having the experience or characteristic or effect of whatever is being simulated. Some writers define simulation as a dynamic representation achieved by building a model and moving it through time. This definition is especially appropriate for those dealing with mathematical modeling and computer models. Simulation is in common use today. All of us have had experience watching simulations of space flight or moon landings in the last year. The concept of simulation is as old as some of the early Greek and Roman war games. War strategists have used simulation regularly in their endeavors over this entire period of time. The kind of simulation dealing with management, gaming and instruction has become increasingly popular since the mid-1950's.

There are many ways of classifying simulations, one being by degree of abstraction. In this classification, one extreme would be the case where a real system itself was used as a model to gain knowledge about itself; the other end of that continuum is a complete analytical simulation wherein the real system is represented by some kind of a mathematical model. Another way of classifying simulations is by their objective or use. They might be used, for example, as evaluation or research tools, as teaching, training or instructional devices, or as demonstrations. Another common classification is by the degree of human involvement. Categories in this classification might include (1) human simulations (man-man simulations) such as role playing or some business games; (2) mixed man-machine simulation such as microteaching or those used frequently in business and military gaming; and

(3) machine simulations such as that used in computer problem solving behavior or artificial intelligence. Another classification is that by the type and amount of simulated materials used. Categories range from the saturation approach in which the person engaged in simulation receives a great amount of information to micro-simulations where there is a much smaller amount of data available to the person engaged in simulation activity and, finally, to the non-material based simulation where persons are placed in situations much the same as they experience in the real world.

There are two strategies that I would like to make reference to in which simulation might be used in planning program change. They are modeling the system and tooling up for planning.

Modeling the System. Modeling the system is a very complicated endeavor in any system that is as complex as an educational organization. In attempting to develop a model for a given system, Schmidt and Taylor suggest that there are three possible cases.

1. The system is amenable to both description and analysis by a mathematical model.
2. The system is amenable to description by a mathematical model. However, correct analysis of the model is beyond the level of mathematical sophistication of the analyst.
3. The system is so complex that description of the system by a mathematical model is beyond the capabilitites of the analyst.[7]

In the absence of a mathematical model, it is possible for cases two and three to lend themselves to simulation for solution. Simulation of this nature is a very technical endeavor and will not be discussed in any detail in this paper primarily because of the lack of expertise on the part of the writer. In simulations of this nature, the model of the system which is created may be employed as often as desired to analyze different situations. These simulation methods are useful for analyzing proposed systems in which information is incomplete. Usually the data for further analysis can be obtained from a simulation model much more cheaply than it can be from a real world system. There are some problems in this utilization of simulation including the fact that the simulations are very costly to construct and to validate. Normally these simulations require a computer system and may, in fact, involve a good deal of computer time which is also costly. The most serious disadvantage, however, is directed more toward people than technique. The number of persons skillful in creating and utilizing such simulations is limited.

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[7] J. W. Schmidt and R. E. Taylor, Simulation and Analyses of Industrial Systems (Homewood, Illinois: Richard D. Irwin, Inc., 1970), p. 5.

There are a number of instances where this kind of system simulation has been used to advantage. some of the work done by those in the fields of industrial engineering and business administration can be useful to those of us working in education. We can, for example, simulate some of the subsystems of an educational enterprise. In this kind of simulation, the primary purpose might well be that of achieving the most effective allocation of available resources over a period of time. The plans might be designed around program elements and the related sources impacts rather than around any kind of object classifications. For example, student enrollment by major academic field generates a demand for instruction within each subject category. Instructional demand by category along with maximum class size restrictions generates faculty teaching loads by faculty skill and determines classroom and laboratory facility utilization. All of these activities together with tuition and scholarship rates, faculty salary structure, and operating expense relationships affect the source and uses of funds.

In creating this kind of simulations, a model of the system must be designed and those variable which are key to the system must be identified. If our concern is providing some kind of a particular service for students, as for example health services, we must identify the kinds of variables that will affect that health service opeation and the kind of output that is expected. To be included as input variable might be numbers of students, numbers of visits per quarter per year, numbers of stations necessary to accommodate that particular service, numbers of personnel associated and time.

In the area of vocational education it would appear that this use of simulation would be particularly apt. As an example of such utilization, let us assume that there is identified an urgent need for laboratory assistants to work in secondary school science classrooms in the state. If the state's vocational education program is charged with responding to that demand, we might well create some kind of a model of a system which would have as its output trained laboratory assistants. In this hypothetical situation, our charge spells out the kind of skills expected of the product and we are to test alternative training strategies for accomplishing the task at hand. One possible training strategy might be that of providing a correspondence course supplemented by laboratory sessions over a period of 18 months. Another possible strategy would be that of bringing the students in for a very extensive program of eight weeks duration at the conclusion of which they would be given certificates. Obviously, there are an indefinite number of strategies which might be designed. For those which appear to be most suitable, we might simulate the training programs identifying key input variables, testing the model using different inputs and examing the effectiveness and efficiency of each strategy.

A more common form of simulation that you've heard about earlier in the week is that of management modeling. An example of such management modeling is the use of PERT or CPM. These are in reality attempts to model activities. They are dealing with abstractions, assessing the order in which activities must take place, and assigning reasonable time limits on these activities.

A rather unsophisticated attempt at modeling a system was made recently by a few of us in the College with a fair degree of success. Faced with a major reorganization of the University, each College was asked to reexamine its own structure. College leaders wanted to insure as best they could that the way faculty groups (production units) were organized and the mechanisms set up to govern the College would facilitate the process of planning, evaluation, and production.[8] There was great concern for utilizing scarce resources to best advantage and for increasing the College's potential to cope with the challenges of today's world as well as shape the world of tommorrow. This obviously called for an organization which would facilitate planning and evaluation in the College.

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[8] Production in the College is defined as knowledge generation, syntheses, dissemination, and utilization.

Faced with such a charge, two advocate teams were charged with defining and describing such organizational scheme. The product of these efforts was three "model" organizations. Once this task was accomplished another team charged with evaluating the models chose simulation as the major evaluation strategy. An elaborate set of simulation materials was developed and all the faculty members and administrators plus the key staff members took part in the simulation exercises.

Different "problems" calling for planning and maintenance decisions were fed in to the models. All participants played roles in the simulations and on conclusion of each exercise were asked to evaluate the model. From that experience, there evolved a model for organizing the faculty units and the governance structure of the College. Since that time, I have had similar success experiences using simulation in this manner in a small department of education in one of the New York State universities and in two county school systems in Ohio.

To translate this experience to your field, let us assume that a State Department of Education is contemplating reorganization and that one of the chief concerns is that of improving its planning capability. A number of alternative models might be generated. For example, one possible model might call for all planning personnel being in a staff position to the State Superintendent; another might call for planning personnel to be housed organizationally in subdivisions of the Department. These or other possible models might easily be tested by designing simulations and feeding planning demands into the models. Utilizing simulation in this manner has another distinct advantage. It forces persons who eventually are going to play roles in the organization to study and evaluate alternative models in advance of adoption rather than just accepting a model designed by someone else.

Tooling Up For Planning. A second manner in which simulation can be used in the program planning endeavor is to tool up a staff so that it is ready to take on this task. It is in this area that we in education have begun to make rapid advancement in the last decade. In the 1950's, the simulation technique became very prominent in a number of management training programs. The technique found its way in the preparation programs in education through the research route. In the mid-1950's, personnel at the Educational Testing Service (ETS) were involved in a test construction process designed to evaluate the effects of instruction in a Command and Staff School of the Air University. Air University administrators were interested in designing an instrument to test the effectiveness of their instructional efforts. Representatives of ETS worked with them in developing an instrument called the "in-basket test," a situational test presented in written form administered to the group. The testing involved responding to some in-basket items containing letters and memoranda. Participants were asked to respond as if they were actually playing a role. They were given some experiences much like those which they would face on the job.

A short time later, the personnel at ETS developed a business in-basket test used primarily by American Telephone and Telegraph Companies in their middle management program. It was picked up and used by a number of other companies. In 1957, the Cooperative Research Branch of US Office of Education made a $250,000 grant for a study entitled, "The Determination of the Criteria of Success in Educational Administration."[9] Although the major objective of the project was to achieve better descriptions and explanations of selected administrative behaviors of selected principals, another objective was to produce simulated situation and problems which could be used for instructing prospective educational leaders.

Following a number of additions and revisions of these materials, a team at the University of Nebraska designed some simulation materials which are intended to provide general educational administrators with an awareness and appreciation of vocational educational programs.[10]

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[9] For a report of the results of this study, see John Hemphill, Daniel Griffiths and Norman Frederiksen, Administrative Performance and Personality (New York: Bureau of Publications, Columbia University, 1962)

[10] Ward G. Sybouts, et.al., Madison Public Schools -- Secondary Curriculum (Lincoln: University of Nebraska, 1968).

My colleagues in the Center for Vocational and Technical Education at The Ohio State University have recently prepared materials which may be of interest to those of you in this audience.[11]

The most common use to be made of simulation materials is to provide real world clinical experience for those preparing for any kind of decision making or planning situation. One of the central values of the simulated positions and problems derives from their reality orientation and their capacity to provide participants and instructors opportunities to test concepts against the facts of decision makers' and planners' lives. The technique can be used to provide cognitive learning experiences relating to some of the problem areas which planners face. The most common use of simulation in training is related to the processes of administration. Simulation as a mode of instruction provides stimuli to introduce concepts related to morale building, decision making, goal setting, initiating change, or planning.

The technique can be used in a number of settings. While simulation materials are used frequently in regular classroom settings, they can be used very effectively in workshop settings either on a university campus or on a regular job site. Many users feel that extended and concentrated time involvement is essential if the participants are really going to be able to take advantage of the materials. Others claim to have used complex simulations effectively in regular class sections meeting from one to three times per week. Use of the less complex, shorter form of simulation materials is much more varied. It is possible, for example to deal with a simple set of concepts using a single in-basket item. These shorter forms share many of the advantages of the case study in this respect.

Professor Richard Wynn reported the following potential strengths of the technique.

1. The evident face validity of the situation stimulates interest and motivation in learning and encourages the subject to behave as he might in reality.

2. The written record of performances results in the accumulation of normative data and permits clinical examination and comparison of "on the job" behavior in identical situation.

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[11] See for example Richard Meckley, Ivan Valentine, and Zane McCoy, Simulation Training in Planning Vocational Education Programs and Facilities (Columbus, Ohio: The Center for Vocational and Technical Education, 1970)

3. Simulation permits the learner to profit from mistakes that might be disastrous on the job.

4. The instructor in a simulated situation can provide the subject with concepts, research evidence, models, or other information which he can't always send in during the actual game.

5. Simulation provides an opportunity to see the whole picture, to view each problem in broad context.

6. Simulation permits a degree of introspection rarely provided on the real job.

7. The Jefferson School situation presents a subject with an interesting object lesson in simulation as a medium of instruction which he may find useful in his own school situation.

8. Simulation presents an extremely useful research medium, providing the collection of normative and comparative data on behavior and performance in identical situations.[12]

Simulation provides participants an opportunity to encounter situations much like those found in the very ambigious world planners face each day on the job. Participants are involved in practicing skills that are quite unlike those included in previous educational experiences. Besides reading about and talking about these skills, they actucally practice them. Participants gain experience in working with others, in recognizing multiple solutions to problems, in attempting to sell others on their own ideas, and in evaluating the ideas of others.

There is a greater interest and awareness of trends and activities in the real world on the part of participants as they are forced to face real world problems. Students are given opportunity to seek pertinent factual information and acquire certain analytical tools including defining problems, weighting evidence, and collecting data, all of which are important in the real world.

Professor Wynn in the earlier stated article lists the following limitations.

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[12] Richard Wynn, "Simulation: Terrible Reality in the Preparation of the School Administrators, "Phi Delta Kappan," December, 1964, pp. 170-173.

1. The use of simulation depends heavily upon the competence of the instructor using it.
2. Simulated materials are expensive to produce and are subject to obsolesence.
3. Considerable uninterrupted time is needed for full comprehension of the background materials before the in-basket items can be undertaken.
4. There is also a serious question of transferability of learning from the simulated situation to others.

Expanding on the capital cost limitation noted above, an important consideration is that of time or opportunity invested in utilization of simulation devices. In calculating costs of instruction, we often omit the cost related to student time; to disregard such "opportunity costs" would be a serious ommission inconsidering this particular technique. If, for example, one wants to impart large quantities of rote knowledge in short periods of time, the technique is certainly not appropriate.

Another of the technique's limitations is that its use may artificially simplify the system or universe. By singling out a few variables and dealing with these, participants may not realize that there are few situations in the real world where only a few variables are at work. It is also possible that the use of simulation materials may encourage conservative behavior. If participants are allowed to be very critical of persons who take risks and experiment with new approaches, there will probably be a tendency to conform towards a normative kind of behavior.

One of the limitations advanced earlier relates to the competency of the instructor. the lack of content in the material demands even more skill on the part of the instructor than in most other instructional technique. The tendency on the part of some users to identify "correct" responses is evidence of lack of understanding of the technique.

In spite of frequent warning, some users tend to view the materials as if they contained all the content to be covered, the concepts and skills to be learning. While one can gain skill in writing memos or responding to telephone inquiries based on the simulation exercises, the skill will have to come from some other source than the materials themselves.

In almost all cases the materials are simply stimulus items which can be used to illustrate some of the content or concepts that are to be learned.

Another shortcoming is related to the fact that materials are not readily available for all kinds of problems that administrators have to face and it will be necessary that some be constructed to illustrate particular concepts or processes the instructor feels important. To the best of my knowledge, those developed at the Center for Vocational and Technical Education are the only ones which relate directly to program planning in vocational education.

An additional shortcoming of the common simulation materials is the fact that decision makers and planners very seldom make decisions without conferring with other people or at least collecting data from them. In other words, most major decisions are made by involving teams of people. The fact that participants are forced to act as individuals and do not come into contact with other persons in the simuatlion makes for an unrealistic situation. It is many times difficult to respond to a stimulus item without having opportunity to contact another person in the system.

In this writer's opinion, the most critical limitation to existing simulation materials is the fact that feedback is not built into the materials. While users can and normally do allow for feedback is not built into the materials. While users can and normally do allow for feedback in the instructional setting, the materials are not developed to a point where feedback is automatic. When a participant responds to an item, he does not get immediate feedback to his response. While participants make a number of decisions, they are not forced to live with the consequences of those decisions and they can go on to make additional decisions in the later stages of the exercise with no feedback resulting from prior actions. Because of the large number of alternative solutions to any problem posed, the computer provides the only possible branching mechanisms which would allow feedback to become an integral part of the materials.

While the use of simulation in training is not limited to the process it seems to be a most appropriate instructional strategy. Planning is a complex endeavor and simulation is one of the better strategies in that it allows for the participant interaction, so essential in planning.

EPILOGUE

This paper dealt with (1) the Delphi Technique as it might be used in predicting future developments and setting priorities on goals or programs and (2) simulation as it might be used in modeling an organization and training people to engage in organizational planning. The paper might well be described as a limited "bag of tricks;" hopefully, you will be able to modify the strategies reported and create others to use these two powerful but simple concepts in improving your organization's capability to plan for program change.